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for California law enforcement

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California Commission on Peace Officer Standards and Training

MEDICAL SCREENING MANUAL

For

CALIFORNIA LAW ENFORCEMENT

R. Leonard Goldberg, M.D.
City of Los Angeles

Shelley Weiss Spilberg, Ph.D.
Commission on POST

Stephen G. Weyers, M.D.
California State Personnel Board

Medical Screening Manual for California Law Enforcement

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POST Media Distribution Center
1601 Alhambra Boulevard
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e-mail: publications@post.ca.gov

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PREFACE

Since its first publication in 1977, the POST *Medical Screening Manual for California Law Enforcement* has been widely used in the evaluation of candidates for the position of entry-level patrol officer. A major revision to the manual was first published in 1993 to ensure that the manual's medical examination and evaluation protocols complied with all state and federal laws protecting the employment rights of individuals with disabilities, including the Americans with Disabilities Act of 1990. Since that time, selected chapters have been revised to incorporate both medical advances and legal developments.

This current edition of the manual is no exception; it reflects recent changes in the detection and treatment of several medical conditions and includes the issuance of new, state-of-the-art hearing screening guidelines. It also reflects significant changes to California disability statutes that went into effect on January 1, 2001. These changes and their impact on pre-employment medical screening are discussed in the Background Information section of the manual.

The intended readership of this manual includes both physicians and hiring authorities. Their cooperative, interdependent role in the medical screening process is discussed in the background information chapters.

Comments and suggestions are therefore not only welcome, but actively solicited. Questions and feedback should be directed to Shelley Spilberg, Ph.D., c/o Commission on POST, or she can be contacted at (916) 227-4824 or Shelley.Spilberg@post.ca.gov.

KENNETH J. O'BRIEN
Executive Director

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INTRODUCTION

This version of the POST Medical Screening Manual for California Law Enforcement, was first published in 1993. Revisions since that time have been geared towards incorporating the many medical and legal advances (and challenges) that have transpired since that first issuance. Creating a medical screening manual to meet those challenges involved the participation of over numerous medical specialists as well as experts in areas such as employment law, civil rights legislation, industrial/ organizational psychology, and epidemiology.

LAYOUT OF THE MANUAL

The revised manual consists of several major sections, each with a specific purpose and intended primary readership. These sections are:

I. Background Information

The chapters in this section are intended for both physicians and hiring authorities. They provide an overview of the development of the manual and its proper use in the screening of patrol officer candidates.

Project Goals and Methodology. Describes the objectives that guided the development of the revised manual, as well as the procedures followed in its creation.

Pre-Employment Medical Screening and the Law. Discusses state and federal laws that have an impact on the medical screening of patrol officer candidates, and how these laws are addressed in the manual's examination and evaluation protocols. A summary is provided at the end of the chapter for quick review.

Patrol Officer Job Demands: Their Implications for Medical Screening. The first part, developed especially for hiring authorities, provides guidance on how to identify essential job functions. The second part, developed for both physicians and hiring authorities, reports the results of several statewide job analyses conducted by POST that have implications for the medical screening of patrol officer candidates.

General Guidelines for Using the Medical Screening Manual. These guidelines provide general rules for use of the manual in the proper conduct of pre-placement medical screening. This chapter includes a discussion of the respective roles of physician and personnel administrator, as well as the role of medical screening in the larger pre-employment process.

II. Examination and Evaluation Protocols

The protocol chapters are the heart of the manual. Written expressly for the screening physician, they provide detailed guidance on medical screening of patrol officer candidates. Over fifty of the most commonly detected medical conditions are discussed by name. However, the guidance offered in these protocols can be "interpolated" to aid in the assessment of virtually any medical condition.

III. Appendices

Appendix A: Medication-Related Impairment provides a generic approach to the evaluation of candidates who use medication.

Appendix B: Participating Medical Specialists.

Appendix C: Medical History Statement has been updated to be compatible with the examination guidelines in the protocol chapters.

Appendix D: Medical Examination Report. This form has two parts -- one for use by the physician in recording notes and findings made during the examination, and another part for translating those medical findings into specific, job-related recommendations to the employer regarding the candidate's suitability for the patrol officer position. The second part also includes a section for use by employers in documenting (and justifying) their ultimate hiring decisions.

Note: Every effort will be made to update this manual as necessary, not only to keep it current with changes in equal employment law and medicine, but also in response to suggestions based on personal use of this manual by agency physicians and employers. POST therefore solicits such feedback from all manual users.

PROJECT GOALS AND METHODOLOGY[1]

Project Goals and Objectives

The direction of the project was dictated by three major goals: (1) consistency with the law; (2) utilization of the best available medical information and resources; and (3) usefulness to those involved in the medical screening of patrol officer candidates. These goals were translated into the following objectives for the manual:

1. Examination and evaluation protocols that promote the *individualized assessment* of each candidate, rather than categorical, exclusionary criteria.
2. Direct links between a candidate's medical status and his/her ability to safely perform specific patrol officer job functions.
3. Decision-making guidelines consistent with risk management criteria permitted by state and federal law.
4. Guidance based on valid medical information, including medical literature, epidemiological studies, and the in-depth input of medical specialists.
5. Detailed coverage of commonly-detected medical conditions, rather than cursory coverage of all possible conditions.
6. Proper partitioning of the roles of physician and hiring authority in the medical screening process.
7. Promotion of diagnostic procedures that are reliable, valid, and cost efficient.
8. Usefulness to medical screening physicians in both form and substance.
9. A format that simplifies the process of creating and distributing future updates.

Development of Medical Protocol Chapters.

The manual's examination and evaluation protocols were developed through a collaborative, iterative procedure involving the in-depth participation of medical experts from a wide range of specialties. Spearheading this effort were Dr. R. Leonard Goldberg, Assistant Medical Director for the City of Los Angeles and Dr. Stephen G. Weyers, Medical Officer for the California State Personnel Board. Both of these physicians have extensive experience conducting and overseeing the medical screening of patrol officer candidates. Their key roles in this project included developing the draft protocol chapters, providing medical leadership during specialist panel meetings, and revising the chapters per the decisions reached during these meetings.

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[1]Author: Shelley Weiss Spilberg, Ph.D.

Step 1: Development of the Draft Protocol Chapters. A protocol chapter was drafted for each body system according to a predetermined format that included:

- Identification of medical conditions commonly observed among patrol officer candidates;
- A brief description of the implications of these medical conditions for performance as a patrol officer;
- General screening recommendations for all candidates to detect the presence of relevant conditions;
- Specific considerations and recommended evaluation protocols for each highlighted condition.

Extensive medical literature reviews were conducted in the course of developing each protocol chapter. Concurrent with drafting the protocols, questions for specialists were generated for discussion during the panel meetings.

Step 2: Selection of Medical Specialists. Once drafted, a protocol chapter was submitted to a panel of specialists. The criteria for selecting specialists for these panels included:

(1) Extensive experience and expertise in their medical specialty;

(2) Expertise that complemented that of the other panelists to ensure that all highlighted conditions were adequately reviewed;

(3) Experience in occupational screening issues;

(4) An interest in the development of public policy and guidance; and

(5) An ability to work in an interactive small group setting.

Several methods were used to locate potential panelists. First, national health organizations were contacted (e.g., American Diabetes Association, American Heart Association, American Cancer Society) and invited to nominate specialists who met the above criteria. Second, names of prominent, published specialists were identified during the review of the medical literature. Third, nominations were solicited from major medical schools, research institutions, and medical societies.

A complete list of the medical experts who served on the specialist panels is located in Appendix B.

Step 3: Conduct of Panel Meetings.[2] Several weeks prior to each panel meeting, the participating specialists were sent a set of materials to review, including: (1) the draft protocol chapter and attendant questions; (2) an overview of the project goals and procedures; (3) a brief description of the legal issues involved in developing medical screening guidelines; (4) a description of patrol officer job demands and

[2] Instead of a panel meeting, specialists conducted independent reviews of the protocol chapter for Dermatology.

working conditions; and (5) research articles, case studies, or other ancillary information deemed useful to participants. Participants were asked to carefully review all materials in advance of the panel meeting.

Initial panel meetings were 1-2 days in length. Participants included the oversight physicians (Drs. R. Leonard Goldberg and Stephen Weyers), the medical specialists, and the project manager (Shelley Spilberg). Experts in complementary fields (e.g., legal firearms, etc.) were included as appropriate.

Each meeting began with a brief orientation session which included an overview of the project, the role of medical screening examinations in the selection of patrol officers, and a review of pertinent legal issues and job demands. The panelists spent the remainder of the meeting performing a collaborative, detailed review of the draft protocol. The recommendations of the group were recorded for incorporation into the next iteration of the chapter. To the greatest extent possible, these recommendations were substantiated by citation to the medical literature.

Step 4: Post-Panel Revisions. Each draft chapter was revised, per the recommendations of the panelists, by the physician who authored the earlier version. This version was then sent back to the panelists, who reviewed it to ensure that it fully and accurately reflected their recommendations. Their feedback was incorporated into the third and last substantive iteration of the chapter.

Step 5: Continued Updates. In keeping with its intended purpose as a living document, specific chapters have undergone revision to reflect medical advances and legal developments. The procedures for creating these updates is similar to that used to create the initial chapter; however, specialists' input is so often acquired through mailed correspondence, unless a face-to-face meeting is deemed necessary.

PRE-EMPLOYMENT MEDICAL SCREENING AND THE LAW[1]

INTRODUCTION

The process and decisions resulting from the medical screening of patrol officer candidates are dictated as much by state and federal regulations as by accepted medical practices. It is therefore imperative that physicians as well as hiring authorities have a full and complete understanding of the legal issues underlying medical screening for occupational suitability.

When this legal section was first published in 1993, the federal Americans with Disabilities Act (ADA) was very new. Since that time, regulations and guidelines from the enforcement agency – the EEOC – as well as case law have shaped the ADA's influence on pre-employment medical screening and related personnel practices. However, the impact of the ADA has been in good part eclipsed by very recent changes to California disability statutes.

This chapter will distill both federal and state disability laws as they relate specifically to the conduct of pre-employment medical screening of entry level patrol officers in California. However, this information cannot and should not be considered legal advice; legal counsel should be consulted when specific compliance questions arise.

BACKGROUND

California law requires that all individuals empowered as patrol officers be evaluated by a licensed physician and surgeon to ensure that they are free from any physical condition which might adversely affect their exercise of these powers (2 Cal. Gov. Code 1031(f)). The POST requirements regarding the conduct of this examination are spelled out in POST Commission Regulation 1002(a)(7) and Commission Procedure C-2.

The interpretation and implementation of these requirements must be tempered by other state laws that protect the rights of those with medical conditions and physical handicaps. California has always been a very progressive state in this regard. Since 1975, the California Fair Employment and Housing Act (FEHA) has prohibited state employers of five or more from discriminating on the basis of physical handicap or medical condition.

FEHA was revised by the enactment of the Prudence Kay Poppink Act (PKP - formerly A.B. 2222) which became law on January 1, 2001. The PKP was in direct response to recent judicial decisions that restricted protection under the ADA. For example, in

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[1]Author: Shelley Weiss Spilberg, Ph.D.

recent years federal courts have concluded that conditions such as cancer, epilepsy, and asthma, and virtually all correctable conditions are *not* disabilities. As stated by the law's author, California Senator Sheila Kuehl, the new "California disability law provides protections independent from the ADA . . . the ADA provides a floor of protection to Californians with disabilities, but not a ceiling."

When differences exist between state and federal law, the latter technically predominates. However, since the ADA does not prevent a state or local entity from affording even greater employment protection to the disabled, in reality, the law that provides the most protection will prevail – which, will be the California FEHA in virtually all cases.

WHO IS DISABLED

Both the ADA and FEHA afford employment protection only to those who are deemed disabled. As a result of the PKP, however, California provides much broader interpretation of what constitutes a disability, relative to the ADA.

Limits v. Substantially Limits. In California, a physical disability is defined as an impairment that *limits* a *major life activity*, which is defined as making the achievement of the activity difficult. The ADA, however, requires that the impairment *substantially* limit the major life activity before it is considered disabling. Both laws include those who have a "record or history" of a disability, as well as those who perceived (correctly or incorrectly) as being disabled.

Mitigating Measures. Another key difference between state and federal law is whether mitigating or corrective measures are to be considered when determining disability. As a result of three 1999 U.S. Supreme Court cases (Sutton v. United Air Lines, Inc.; Murphy v. United Parcel Service, Inc.; Albertson's, Inc. v. Kirkingburg, 1999), under the ADA, disabilities are to be defined after consideration of any mitigating or corrective measures, such as medications, assistive devices, prosthetics or reasonable accommodations (unless the mitigating measure itself limits an individual's ability to participate in major life activities). The new California FEHA, however, specifically states that individuals are to be considered in their unmitigated state when evaluating disability. The new FEHA also specifically covers a variety of medical conditions which, once mitigated, may not be considered disabilities under ADA, including (but not limited to) chronic or episodic conditions such as HIV/AIDS, hepatitis, epilepsy, seizure disorder, diabetes, clinical depression, bipolar disorder, multiple sclerosis, and heart disease.

Working as a Major Life Activity. There are also significant differences between the ADA and the new FEHA in the interpretation of "major life activity." The list of included activities themselves is quite similar for both laws, and includes functions such as caring for one's self, performing manual tasks, walking, seeing, hearing, speaking, breathing, learning and *working*. However, according to the EEOC regulations interpreting the ADA, individuals cannot be "substantially limited in the major life activity

of working" unless they provide evidence that they are substantially limited in performing a *broad class or range of jobs*. This is in sharp contrast to the new FEHA, where the major life activity of "working" can refer to the ability to do *one specific job*.

"Medical Conditions." Unique to state law is the specific inclusion of "medical condition" as a protected disability. "Medical condition" is defined, in part, as any health impairment related to or associated with a diagnosis of cancer or a record or history of cancer. Unlike the physical disabilities discussed above, a medical condition need not be linked to a limitation in performing a major life activity in order to qualify as disability. In contrast, all impairments must be substantially limiting to merit entitlement under the ADA.

The unique "medical condition" provision of the California law includes genetic characteristics not presently associated with any symptoms of any disease or disorder. It is interesting to note, however, that it is unlawful to subject an applicant or employee to a test for the presence of specific genetic characteristics; therefore, the applicant must inform the prospective employer that he or she carries such a gene, otherwise the employer has no way of knowing that this medical condition exists (since, by definition, it is asymptomatic).

Excluded Conditions. Both state and federal laws specifically exclude certain conditions from protection. These include:

- Sexual behavior disorders, compulsive gambling, kleptomania, or pyromania; or psychoactive substance use disorders resulting from the current unlawful use of controlled substances or other drugs;
- Temporary, nonchronic impairments/conditions of short duration, and with little or no permanent impact (e.g., broken limbs, sprained joints, concussions, influenza, pregnancy);
- Physical characteristics, such as eye and hair color, left-handedness, height, or a predisposition to illness or disease;
- Advanced age (but medical conditions commonly associated with age, such as hearing loss and arthritis, are protected).

Bottom Line: The new FEHA clearly serves to broaden coverage to individuals who would not be deemed as disabled by the ADA. Even prior to the PKP, cases litigated under the FEHA have involved minor and/or temporary conditions, such as myopia, obesity and pregnancy. Therefore, it is safest to assume that candidates found unfit for patrol officer work due to the presence of a physical or medical condition are "disabled," by virtue of the nature of their disqualification.

ESSENTIAL JOB FUNCTIONS

Neither state nor federal law require hiring applicants who, even with reasonable accommodation, cannot perform the essential (vs. marginal) job duties – defined as the fundamental job duties of the position. The designation of essential job functions for a given position is the purview of the employer, not the physician. Legitimate bases for determining essential job functions include:

- employer's judgment
- written job descriptions
- amount of time spent on the job performing the function
- consequences of not requiring the incumbent to perform the function
- collective bargaining agreement
- work experiences of past incumbents
- current work experience of incumbents

Not every function that all employees actually perform constitutes an essential function. The key to determining whether a job duty rises to the level of being "essential" is if the removal of the function would result in a fundamental change in the position itself.[2]

Role of Physician vs. Employer. It is the physician's responsibility to provide guidance on the candidate's *functional limitations* so that the employer can determine whether the candidate is qualified. The doctor must therefore understand the job for which candidate is being considered so that the appropriate functional skills can be evaluated. However, it is the employer (not the physician) who must ultimately decide whether the individual is qualified, and consequently to analyze job functions, identify which functions are essential, and determine whether there is reasonable accommodation available that does not create an undue hardship.

If the doctor's medical screening decisions are based on mistaken assumptions about what the job requires, the doctor's opinion may be discounted by the court. For example, in King v. Yellow Freight System, Inc. (2000), the court found that the employer may have improperly presented inflated physical requirements of a job to several doctors who then determined that an employee couldn't perform the job. In Oswald v. Laroche Chemicals, Inc. (1995), the employer relied in part on the employee's *own* physician's determination that he was not able to perform the job. However, the court questioned whether the functions considered by the doctor were actually necessary for the performance of the job.

Particularly when it comes to public safety position, however, the courts generally (but not always) accept the judgment of the employer in identifying essential job functions. In Martin v. State of Kansas (1999), for example, the court acknowledged the right of

[2] Note: To be able to perform job functions (required or otherwise), an individual must consistently show up for work. Therefore, a candidate whose medical status/history indicates a high likelihood for needing time off beyond what can be reasonably accommodated by the hiring agency could be considered unable to perform the essential job functions by virtue of these excessive absences.

the state penitentiary to broadly define its prison guard positions such that all employees must be able to perform a multitude of individual job assignments (thereby denying the plaintiff's request for permanent watch tower duty). In a similar case (Hoskins v. Oakland County Sheriff's Dept., 2000), a deputy sheriff at a county jail was deemed not qualified for her position due to her inability to restrain inmates, even though deputies are infrequently called upon to physically restrain inmates. In their ruling, the appeals court acknowledged both that controlling inmates is the reason the position exists, and that the consequences of a deputy's failure to successfully restrain inmates could be severe.

The next chapter, "Patrol Officer Job Demands: Their Implication for Medical Screening," provides instructions for identifying essential job functions. It also includes several listings of patrol officer job demands that have relevance to the medical screening of candidates, based on several statewide job analyses performed by POST. They are included to state the assumptions about the essential job functions made during the development of this manual, as well as to assist employers in the development of agency-specific job descriptions

REASONABLE ACCOMODATION

If a candidate with a disability is found unable to perform an essential job function, the next step is not disqualification, but rather consideration of reasonable accommodation options. A reasonable accommodation is defined by the EEOC as "any change or adjustment to a job or work environment that permits a qualified candidate or employee with a disability to participate in the job application process, to perform essential job functions, or to enjoy the benefit and privileges of employment equal to nondisabled employees."

- Many classic forms of reasonable accommodation are not necessarily relevant to the patrol officer position (e.g., wheelchair ramps); however, there are several types of accommodation that are pertinent, including:

- Restructuring a job by reallocating or redistributing marginal job functions;

- Altering when or how an essential function is performed;

- Permitting use of accrued paid leave or unpaid leave for necessary treatment;

- Modifying examinations, training materials or policies (e.g., use of learning aids);

- Acquisition or modification of equipment and devices (e.g., modified car seats or uniforms).

The selection of a reasonable accommodation must be based on a case-by-case assessment of the job, the individual, and the essential job function(s) that the

otherwise qualified individual is unable to safely perform. This assessment involves the employer, the candidate and quite often the screening physician as well.

Under the new FEHA, it is the *employer's* obligation to engage in a timely, good faith, interactive process with the applicant in order to determine effective, appropriate reasonable accommodation options, as well as to make the ultimate selection of the reasonable accommodation that would allow satisfactory performance of the essential job functions.[3] The *individual* must make the employer aware of any "hidden" disabilities (and provide verification upon request). Candidates must also cooperate in the interactive process; they cannot refuse an accommodation merely out of preference; nor can they refuse to acquire additional information as necessary (for example, updated medical records).

The *physician* can also play an integral role in the reasonable accommodation process. As a result of the medical examination, the physician should identify any work restrictions, limitations, or other constraints that must be considered before placing the individual on the job. One of the most common forms of reasonable accommodation of relevance to patrol officer candidates is the use of medications, medical devices and medical monitoring programs. Examples of such regimens and devices include the use of glucose monitoring systems by those with diabetes, the use of anti-epileptic drugs by those with epilepsy, and the use of soft contact lenses or other corrective devices for those with vision impairments. Central to this form of accommodation is the use of pre-placement contracts and monitoring systems to ensure complete and safe compliance with the prescribed regimen.

Undue Hardship. The employer has the ultimate responsibility for determining if the required accommodation is not only "reasonable" (i.e., would actually enable the candidate to perform the job), but also one that would not constitute an "undue hardship." To be considered an undue hardship, an accommodation must be unduly costly, extensive, substantial, or disruptive, or one that would fundamentally alter the nature or operation of a business.

In its Enforcement Guidance on Reasonable Accommodation and Undue Hardship (1999), the EEOC stated that undue hardship may result where an accommodation "would be unduly disruptive to other employees' ability to work." For example, the EEOC stated that if modifying one employee's schedule as an accommodation would so overburden another employee that he would not be able to handle his duties, the employer could show undue hardship. A number of court decisions reflect that an accommodation that would result in other employees having to work harder or longer is not required under the ADA. The employer, however, has the responsibility to base the undue hardship assertion on a strong factual basis, free of speculation or generalization about the nature of the individual's disability or the demands of the particular job.

[3] A Job Accommodation Network (JAN) has been established to assist employers in identifying appropriate reasonable accommodations. The JAN telephone number is (800) 526-7234.

Although the list of reasonable accommodation options is wide-ranging and far-reaching, the courts have generally rejected the argument that the reasonable accommodation requirement extends to creating a new position for the disabled candidate, particularly for law enforcement positions. For example, in Davis v. Meese (1989), the court held that it would create an undue hardship to force the FBI to create a permanent, limited-duty assignment for a special agent with insulin-dependent diabetes. Similarly, in Treadwell v. Alexander (1983) the court agreed that limiting a park technician's patrol duties by shifting those tasks to the limited number of other park technicians gave risk to an undue hardship.

Employers need be forewarned, however, that by arguing that to base a rejection on the excessive costs associated with a reasonable accommodation is to invite an audit of their entire operation's financial resources and practices. Both state and federal law stipulates that the cost that must be spent on an accommodation depends on the employer's resources, not the candidate's salary. Note, however, that employers are not required to pay for personal use items (e.g., eyeglasses), even if needed to perform the job; furthermore, an individual can, if s/he so desires, pay for part of the accommodation that makes it an undue hardship for the employer. State rehabilitation agencies may also be able to supply that part of the funding that constitutes an undue hardship.

THE CONDUCT OF MEDICAL SCREENING EXAMINATIONS

Job Related and Consistent with Business Necessity. Both the ADA and the FEHA require all medical screening examinations to be deferred until after a conditional job offer has been made. Furthermore, all candidates for the same position must receive the same examination (although this does not prevent the conduct of a more in-depth examination of candidates who present medical conditions or symptoms that require evaluation).

The ADA allows screening physicians to conduct any post-offer medical test or make any inquiries as they see fit, without concerns that each procedure is of proven job-relatedness[4]. The medical inquiry provisions of the FEHA, however, severely restrict the employer's right to make health inquiries of applicants. State law requires that all examinations and inquiries be ***job-related* and *consistent with business necessity***.[5]

A question or examination can be justified as job-related and consistent with business necessity if an employer has a reasonable belief, based on objective evidence, that having a particular medical condition would impact the ability to perform essential job functions and/or pose a direct threat. Therefore, general questions such as "Have you ever filed worker's compensation?" are now illegal and must be replaced by questions that target functional impairments that may impact the performance of the essential job functions, such as "Have you ever been injured on the job?"

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[4] Although , if challenged, decisions based on the examination must be shown to be job-related and consistent with business necessity.

[5] Furthermore, it is unlawful to subject an applicant to a test for the presence of a genetic characteristic.

Individualized Assessment. Blanket rules forbidding employment of all individuals with a particular disability rarely survive legal scrutiny. In virtually all cases, medical screening decisions must be based on an assessment of specific risk posed by the individual, and the specific physical impairment creating the risk. This evaluation cannot be based upon stereotypes, patronizing assumptions or generalized fears about risks that might occur. Nor can it be based on speculation about health insurance or workers compensation costs. Rather, it must be based upon *reasonable, medical judgment* that itself is based upon the most current medical knowledge and/or best available objective evidence. Reasonable medical judgment may include: (1) input from the candidate; (2) experience of the candidate in previous jobs; and (3) documentation from specialists and/or direct knowledge of the candidate. The assessment must also include consideration of reasonable accommodations as a means of eliminating or reducing the risk below the level of direct threat.

Confidentiality. Information from the medical examination must be treated confidentially. Medical examination records must be maintained on forms and in medical files separate from the individual's personnel file. Access to those records must be limited to: (1) selected supervisors and managers who need to arrange necessary restrictions on the work of the employee and make necessary accommodations; (2) first-aid and safety personnel, should emergency treatment be required; and (3) government officials investigating compliance with the FEHA or ADA.

Although they are entitled to access medical records, it is advisable for personnel administrators and other nonmedical individuals involved in the hiring decision to limit this right to only that medical information necessary to determine the whether the candidate is able to perform the essential job functions (and, if necessary, what type of reasonable accommodation is required to allow the candidate to perform these functions). The POST Medical Examination Report (POST 2-253) includes two sections for the screening physician to complete: Examination Results – for physicians to use to record notes made during the examination; and Candidate Assessment – requiring physicians to translate their findings into an assessment of functional limitations as they relate to job performance.

Note, however, that not all medical screening examination findings are protected by these confidentiality provisions. The detection of sociopathological tattoos, or test results that reveal the current use of illegal drugs are two examples of findings that can (and should) be shared with the background investigator, screening psychologist, etc.

Feedback to Rejected Candidates. Candidates must be made aware of the basis for the disqualification decision. In addition, California law requires that, before a final determination is made, the individual must be allowed to submit independent medical opinions for consideration (Cal. Code Reg. Title. 2, 7294.0).

BASES FOR MEDICAL SCREENING DECISION-MAKING

As discussed earlier, employers can lawfully disqualify candidates who are unable to perform the essential job functions, with or without reasonable accommodation. Employers can also disqualify candidates who would cause a real threat to the health and safety of themselves or others (and no reasonable accommodation exists that would eliminate or sufficiently reduce this risk). The ADA refers to this as "direct threat," defined as "a significant risk of substantial harm." The California FEHA provisions (which were not changed by the PKP) distinguishes between a threat to oneself and a threat to others:

> Health/Safety of Self: After reasonable accommodation, individual cannot perform the essential functions of the position in a manner which would not endanger his or her health or safety because the job imposes an *imminent and substantial* degree of risk to the individual; and
>
> Health/Safety of Others: After reasonable accommodation, individual cannot perform the essential functions of the position in a manner which would not endanger the health and safety of others *to a greater extent* than if an individual without a disability performed the job.

Danger to Self v. Others. As the differences between these two risk standards indicates, California courts require a higher level of justification to defend the refusal to hire a candidate because of safety concerns for the individual alone. Labeled "benevolent paternalism," the courts often see employers' "danger to self" disqualifications as based more on concerns about worker's compensation or health care costs than on concerns about the candidate's safety. For example, in a 1983 precedential decision (DFEH v. City of Sacramento), the FEHC used the more rigorous "danger to self" risk standard in ruling that the disqualification of an applicant for auxiliary police officer due to his condition of spondylolysis was discriminatory, finding that the employer based its decision not on the increased risk to others posed by the applicant, but rather on the fact that if the applicant did get hurt, he would be less likely to get well than others. The courts saw this position as another instance of well-meaning paternalism. Similar conclusions were reached by other courts in cases involving an officer with a missing kidney (Pa. State Police v. Pa. Human Rights Comm'n, 1984), and a police officer applicant with a bullet permanently lodged in his rib cage (Baltimore and Ohio, Ry. v. Bowen, 1984).

Under the ADA there is no distinction between "threat to self" and "threat to others." However, be forewarned that decisions based solely on threat to self are on somewhat shaky ground. The threat to self defense is *not* mentioned in the actual ADA itself, but rather was added by the EEOC in their regulations. In fact, a recent 9th Circuit Appeals Court (Echazabal v. Chevron USA, Inc., 2000) ruled that the "threat to self" is not a legitimate defense (although this ruling itself is being appealed).

The risks inherent to the patrol officer position often make the "danger to self" vs. "danger to others" distinction moot. Incapacitation in the midst of a critical incident, while driving, or during a host of other patrol functions could have dire implications for both officers and the public they serve and protect. It is therefore prudent, whenever possible, to ***base safety-based disqualifications on concerns regarding the endangerment of others rather than the candidate himself/herself.***

The risk standard associated with threat to others -- not endangering the health and safety of others *to a greater extent* than if an individual without a disability performed the job -- is actually quite liberal, since individuals with medical conditions will often have an increased risk by virtue of the symptoms and ramifications of the condition itself. For example, virtually all persons with any adult history of a single idiopathic seizure are at some increased risk, depending on the magnitude of the absolute risk. However, this approach would seem contrary to the requirement to conduct individualized assessment. Therefore, simple use of the increased risk criterion may result in judgments against the employer. Furthermore, it may be prudent to accept some increased risk, depending on the magnitude of the absolute risk. For example, as discussed in the Neurology section, a 1/2000 per year risk of seizing while driving patrol car is three times higher than baseline, yet the absolute risk is quite small. On the other hand, a candidate with a risk > 1/100 has both a risk sixty times greater than baseline, and an absolute risk that would likely expose the employer to negligent hire litigation by injured third parties. Therefore, an absolute risk of >1% per year is used in this manual as an informal rule-of-thumb guideline for determining risk to others.

Future Risk. One of the common mistakes made in pre-employment screening is not hiring an individual because a medical condition will make him/her unable to perform the job *in the future*. Both the ADA and FEHA stipulate that employment decisions must be based on the person's ability to *currently* perform the job, not whether the person might be unable to perform the job at some point in the future. State law permits consideration of whether the individual will be able to safely perform over a "reasonable length of time." Determined on an individual basis, it is to include consideration of : (1) the length of the training period relative to the length of time the employee is expected to be employed; (2) the type of time commitment, if any, routinely required of all other employees for the job; and (3) normal workforce turnover.

The ADA makes no such allowances. However, even under federal law it is permissible to base screening decisions on the expectation that the individual will be able to safely perform throughout the training program. Given that the basic academy program requires a minimum of six months to complete, followed by an 18-month field training program, it is reasonable to consider a candidate's ability to safely perform the essential duties of a patrol officer as extending over a 2-year time period.

The physician must keep in mind, however, that the test for deciding whether a candidate poses a direct threat to future health or safety constitutes more than merely determining the likelihood of experiencing symptoms in the future. Rather, the test is whether the individual will create the risk of future *harm*. For example, the fact that an individual with epilepsy might experience a seizure does not necessarily mean that

he/she would present a direct threat. Instead, consideration must be given to the candidate's history of seizure triggered by job-specific stimuli and the likelihood of a random seizure occurring during police duties that could result in major injury to others (as discussed in the Recommended Evaluation Protocol in the "Neurology - History of Seizure" section of this manual).

It is important to note that it is the **employer**, not the **physician**, who has the ultimate responsibility to determine whether a risk is "significant," whether the harm is "substantial," and whether a reasonable accommodation is available. The risks of liability (on both the employer and the M.D.) are much greater when the physician makes a determination that the employer simply follows (Fram, D., 1993).

Considering Prior Workplace Injuries. Using previous workplace injuries as a basis for disqualification should be done carefully. In their 1996 Enforcement Guidance on Workers' Compensation and the ADA, the EEOC has stated that its investigators will consider:

- whether the prior injury(ies) are related to the person's disability (e.g., if employees without disabilities have similar injuries, this may indicate that the injury is not related to the disability)
- the circumstances surrounding the prior injury (e.g., the actions of others in the workplace or the lack of appropriate safety devices or procedures)
- similarities and differences between the position and the candidate's prior position(s) in which the injury(ies) occurred
- whether the current condition of the candidate is similar to his/her condition at the time of the prior injury(ies)
- the number and frequency of prior occupational injury(ies)
- the nature and severity of the prior injury(ies)
- the amount of time the candidate worked in that same or similar position since the injury without subsequent injury
- whether the risk of harm can be lowered or eliminated by reasonable accommodation

Severity v. Likelihood of Risk. The severity of harm *can* be balanced against degree of harm when making direct threat determinations. In EEOC v. Exxon Corp (2000), the court stated that an "acceptable probability of an incident will vary with the potential hazard posed by the particular position . . . the probability of the occurrence is discounted by the magnitude of its consequences." In an ADA case involving HIV-infected prisoners, the court stated that "the potential gravity of the harm . . . imbues certain odds of an event with significance." By way of analogy, the court noted that "we

are far more likely to consider walking a tightrope to pose a significant risk if the rope is 50' high than if it is 1' off the ground. This is so even if the odds of losing our balance are the same however far we have to fall" (Onishea v. Hopper, 1999).

Cases where the courts have actually helped clarify this degree v. likelihood of risk balance are few and far-between. One such instance was Huber v. Howard County, Md. (1995) where the court found that a plaintiff with asthma posed a safety risk in a firefighter job because there was a ten percent chance he would become incapacitated during fires. The court noted that, "given the life and death circumstances facing firefighters, the employer does not have to assume such a 10% risk."

Inherent Risks to Patrol Officers. Although all employers are required to conduct individualized assessment, the courts have generally granted law enforcement agencies wide berth in their employment decisions, basing their decisions on the costly consequences of law enforcement officers being unable to adequately protect the public in emergency situations. For example, in Burroughs v. City of Springfield (1998), the court sided with the hiring agency which rejected a police recruit with diabetes. The recruit had suffered two episodes where he became dysfunctional and disoriented while he was on duty (although no harm occurred during these episodes). The court determine that the recruit posed a direct threat, noting that "the risk of an armed patrol officer being unable to function in an emergency situation is not a risk we are prepared to force a police department to accept. The inherent and substantial risk of serious harm arising from such episodes, given the nature of police work, is self-evident."

Disqualifying candidates who have been successfully performing the same job elsewhere may also raise suspicions. For example, in Holiday v. City of Chattanooga (2000), the City refused to hire a police officer because of his HIV positive status. The court noted, however, that the individual had successfully completed the city's own rigorous physical agility test and had served as a police officer in several other jurisdictions. Note, however, that if the candidate's condition deteriorates, prior satisfactory performance is less persuasive.

If the job that the candidate has been performing can be distinguished from the job at issue, however, past performance will not be especially persuasive. For example, in Huber v. Howard County, Md. (1995), the candidate argued that, despite his asthma, he was qualified for a career firefighter job because he had been performing as a volunteer firefighter. The court disagreed, noting the differences between a career job and a volunteer job. Similarly, in Trevino v. Rock Island Police Dept. (2000), the court deemed the personal experiences of one monocular police officer as nothing more than subjective beliefs and unsupported conjecture, rather than admissible expert testimony to support the claim that another monocular individual could perform the essential functions of a police officer.

SUMMARY

Laws protecting the employment rights of qualified individuals with disabilities have many important implications for the medical screening of patrol officer candidates.

Those aspects of the law with the most direct relevance to medical screening of patrol officers are reiterated below:

1. **Assume that all candidates who are disqualified or deferred on the basis of their medical screening examination results are protected by fair employment laws.** Therefore, these decisions must be shown to be job-related and consistent with business necessity.

2. **Physicians must be provided with a sufficiently detailed description of the position's job demands (essential and marginal) and working conditions that have relevance for medical screening**. Physicians cannot make a valid determination of a candidate's functional work limitations unless they understand the specific physical tasks to be performed and the conditions under which the job is performed. All hiring agencies must ensure that the job information they supply to their physicians is current, accurate, and appropriate for medical screening.

3. **All screening decisions (particularly those that have an adverse impact on the candidate) must be based on an explicit link between the candidate's condition(s) and his/her ability to perform specific job functions**. A summary decision that does not provide this level of detail is not adequate. The physician should identify the specific job duty(ies) or working condition(s) that prohibit a candidate's performance as a patrol officer and/or create an unacceptable risk of injury.

4. **Conduct all medical screening and make all medical inquiries only after a conditional job offer has been made to the candidate; furthermore all examinations and inquiries must be job-related and consistent with business necessity**. Furthermore, although not prohibited by law, it may be prudent to delay the conduct of drug screening tests to avoid inadvertent disclosure of the use of prescription medication.

5. **Treat all medical information confidentially**. Maintain these records separately; limit the individuals who have access.

6. **Evaluate each candidate on a case-by-case basis; do not make blanket rules excluding all candidates with specific disabilities**. Examine each situation based on the particular facts of the individual and the job.

7. **Physicians and hiring authorities must use the correct risk evaluation criteria in making their screening recommendations and decisions, respectively**. Evidence associated with the immediacy, severity, and likelihood of the risk must all support any decisions of disqualification due to the direct threat posed by the candidate. Concerns regarding a candidate's risk to others takes precedence over the risk to self in this assessment.

8. **Medical decisions should be supported by generally accepted medical evidence**. Screening physicians must understand that their personal opinion is less important than a generally accepted medical opinion. However, general medical evidence must also be appropriately applied to the specifics of the individual's condition.

9. **Consider reasonable accommodations**. Before denying a candidate a job because of his/her inability to perform the essential functions of the job or due to a direct threat risk, the physician and the employer must consider accommodations that could eliminate or reduce this risk.

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PATROL OFFICER JOB DEMANDS: THEIR IMPLICATION FOR MEDICAL SCREENING

An important prerequisite step in the development of a lawful medical screening process is the identification of the functions of the job, both essential and marginal. Employment decisions should be based on each candidate's ability to safely perform all required duties associated with the patrol officer position. Therefore, it is imperative that employers provide their screening physicians with a description of the job demands that is comprehensive, accurate, sufficiently detailed, and relevant to the medical evaluation of candidates.

This section is divided into two parts:

> Part 1: Identifying Job Functions provides information on both required and recommended ways to delineate essential job demands;
>
> Part 2: Patrol Officer Job Information describes the results of statewide job analyses conducted by POST that have relevance for the medical screening of patrol officer candidates. It also includes a discussion of the impact of job stress on the patrol officer position, based on a literature review in this area.

PART 1: IDENTIFYING JOB FUNCTIONS

A. Criteria for Identifying Essential Job Functions

As described in the preceding chapter, "Pre-Employment Medical Screening and the Law," the determination of whether a candidate is "otherwise qualified" for a position is based on his/her ability to perform the essential functions of the job. The ADA provides fairly specific guidance regarding how to identify essential job functions. To be essential, a job function must first be real, that is, it must actually be performed on the job. Second, in must be universal, i.e., it must be required of all employees in the particular job function. Third -- and that which distinguishes an essential from a marginal job function -- is that an essential function, if removed, would fundamentally alter the job.

The EEOC regulations identify three types of job functions that can be considered essential, per the above criteria (29 CFR 1630.2(n)):

(1) The reason the position exists is to perform the particular function. For example, in the case of a security guard who checks identification cards, the ability to read the cards is an essential job function, since the only reason the position exists is to have identification cards checked.

(2) There are a limited number of employees available among whom the performance of the job function can be distributed. This is especially important where the total number of employees is low and/or where there are fluctuating job demands. Where there are a small number of employees for the volume of work to be performed,

each employee may be called upon to perform a multitude of different functions. Since in these situations an employee's ability to perform each function becomes critical, the options available to the employer for organizing the work among employees becomes more limited.

A similar situation might occur in a larger work force which experiences heavy demands followed by low demand periods. Although job functions could be distributed during low demand periods, during peak demand periods (e.g., emergency situations), the performance of each function becomes more critical and might limit the employer's flexibility in reorganizing operating procedures.

(3) The function is highly specialized such that the employee is hired for his or her expertise or ability to perform the particular function. In certain, highly skilled positions, an employee may be hired for his or her expertise or ability to perform a particular and specific job function. The performance of that specialized task would then constitute an essential function.

B. Evidence of Essential Job Functions

In conducting their reviews, regulators will look to the following evidence as to whether a particular function is essential:

- The employer's judgment as to what functions are essential;
- The employer's written job description, prepared before advertising or interviewing job applicants;
- The amount of time spent by employees performing the function;
- The consequences resulting from improper performance or a failure to perform the function;
- The work experience of past and current employees;
- The terms of a collective bargaining agreement.

The consequences of poor or inadequate performance can be far more important than the frequency of task performance in determining if a task is essential, particularly for positions like that of patrol officer which consist of highly critical but infrequently performed job functions (e.g., subduing combative subjects).

C. The Role of Job Analysis in Identifying the Essential Functions of the Job

The ADA does not require an employer to conduct a formal job analysis in order to identify essential job functions. However, a properly-conducted job analysis can provide an objective, defensible basis for the development of medical selection criteria and is therefore highly recommended.

There are a variety of job analysis methods, but not all of them are appropriate for the purpose of developing essential job functions or medically-oriented screening criteria. For example, an analysis that details the many different types of paperwork involved in law enforcement may be useful for developing job knowledge tests, but would offer little in the way of providing physicians with relevant job functions upon which to medically evaluate candidates.

Another example of an inappropriate job analysis method would be one that required employees and their supervisors to rate the importance of general characteristics such as "strength," "endurance," or "intelligence" without linking these characteristics to specific job functions or tasks. Such general information may not identify, for example, whether upper body or lower body strength is required, or whether muscular endurance or cardiovascular endurance is needed to perform a particular job function. Such information, by itself, would not be sufficient to determine whether a candidate who has particular limitations can perform an essential function with or without accommodation (EEOC, 1992).

A job analysis may contain information on the manner in which a job is currently performed, but should not necessarily conclude that the ability to perform the job exactly in that manner is an essential function unless there is no other way to perform the function without causing undue hardship. For example, an individual with a missing finger may need to grasp a firearm in an unconventional manner, but may be able to do so with a satisfactory degree of strength and accuracy.

D. Job Analysis Techniques

Job analysis information can be collected using a variety of techniques, including:

- Review of current job descriptions
- Interviews with supervisors and employees
- Development and administration of questionnaires
- Use of daily job diaries by employees
- Review of records (e.g., police reports, critical incident reports)

If at all possible, someone experienced in conducting job analyses should assist in selecting the job analysis method and otherwise participate in the effort. However, small employers may wish to conduct an informal analysis by simply observing and consulting with current employees, prior employees, and/or supervisors. If possible, it is advisable to observe and consult with several employees under a range of conditions in order to get a better idea of all job functions and the different ways they may be performed (EEOC, 1992).

PART 2: PATROL OFFICER JOB INFORMATION

This section presents the results of several statewide patrol officer job analysis projects conducted by POST that have relevance for the medical screening of candidates. The impact of job stress on patrol officers is also discussed, based on a literature review in this area.

The job information presented below is provided to: (1) identify the job-analytic assumptions made during the creation of the manual's medical protocols; and

(2) assist law enforcement agencies in their delineation of essential patrol officer job functions. **Before adopting these results, each department should verify the relevance and accuracy of this statewide job information for its own organization.**

A. POST 1979 Analysis of Patrol Officer Duties and Task Groups (Table 1)

In 1979, POST conducted a job analysis survey of 1,720 officers and 717 supervisory/command personnel from 219 (53%) of the 416 police and sheriffs' departments in the POST program (Kohls, et al., 1979). This survey yielded a vast amount of information on the patrol officer position; Table 1 presents only that part of the job information that may have relevance for medical screening.

Table 1 includes a broad range of patrol officer duties and tasks, including those related to physical performance, patrol and investigation, traffic/motor vehicles, oral communications and written communications. The average importance ratings assigned to each task group are also included.

B. POST 1985 Analysis of Patrol Officer Physical Job Demands (Table 2)

In 1985, POST studied the physical demands of the patrol officer position (Berner, et al., 1985). A total of 1,625 officers from across the state maintained activity logs for eight weeks, during which time they detailed the nature, severity, and consequences of each job-related physical activity in which they engaged. The most frequently reported physical activities are detailed in Table 2.

A total of 1,641 physical incidents were recorded, which translates into a physical incident rate per officer of 23 per year. By far, the most commonly reported physical activity involved resisting combative subjects. In over 50% of the physical incidents, reported failure to perform (or perform correctly) would have likely resulted in injury to self or others.

C. POST 1992 Analysis of Patrol Officer Physical Activities (Table 3)

In 1992, POST conducted another analysis of the type and frequency of physical activities engaged in by patrol officers (Weiner, 1992). In this study, field training officers recorded and rated the critical physical activities of 377 patrol officer trainees over the course of their field training (an average of 37 shifts per officer). The study was conducted across five police departments: Oakland, San Francisco, Los Angeles, Sacramento, and San Diego. Results are displayed in Table 3.

The physical activities reported in Table 3 are divided into two categories: (1) those of a combative nature; and (2) those pertaining to emergency response. Combative incidents were more frequently reported, with an average per officer incident rate of 97 per year, relative to an average emergency response incident rate of 13 per year. There was a combined critical physical incident rate of 110/year.

TABLE 1: Patrol Officer Duties and Task Groups (1979)

Only task groups from the 1979 POST job analysis that would appear to have relevance for medical screening are included. Also included are the average importance ratings assigned to each task group by job experts (5=critical; 4=very important; 3=important; 2=of some importance; 1= of little importance) and examples of tasks underlying each duty.

I. PHYSICAL PERFORMANCE DUTIES

RESTRAINING/SUBDUING - involves restraining and/or subduing individuals by means of baton techniques, locks, grips or holds, or restraining devices, such as handcuffs (3.9)

- Handcuff suspects or prisoners
- Subdue attacking or resisting persons using locks, grips or holds
- Use baton to subdue attacking or resisting persons
- Use restraining devices other than handcuffs (e.g., leg irons, straps)

PHYSICAL PERFORMANCE - involves physical activity such as lfiting, carrying or dragging heavy objects, climbing or jumping over obstacles, running, etc. (3.1)

- Pursue fleeing suspects on foot
- Lift/carry heaving objects (e.g., disabled person or equipment)
- Pull oneself up over obstacles
- Climb up to elevated surfaces (e.g., roof)
- Jump or climb over obstacles (e.g., walls)
- Balance oneself on uneven or narrow surfaces
- Use bodily force to gain entrance through barriers (e.g, locked doors)

II. WEAPONS HANDLING (*including use of interior body armor*) (4.2)

- Draw and fire handgun/rifle/shotgun at persons
- Clean and service weapons
- Fire automatic weapons

II. PATROL AND INVESTIGATION DUTIES

ARREST AND DETAIN - involves arresting persons (with and without warrant) and guarding prisoners (3.5)

- Arrest persons with and without warrants
- Take into custody persons arrested by citizens
- Guard prisoners/inmates detained at facility other than jail

ADMINISTER FIRST AID (4.2)

- Administer CPR and other first aid techniques
- Operate resuscitator
- Control bleeding (e.g., apply direct pressure)

SURVEILLANCE - tasks that require careful observation such as while following suspicious vehicles, patrolling physically hazardous locations, operating observation posts, etc. (includes use of binoculars, photographic equipment, etc. (2.9)

- Follow suspicious vehicles
- Operate assigned observation post to apprehend criminal suspect (e.g., stakeout)
- Clock speed/visually estimate speed of vehicles

DECISION MAKING - involves analysis, evaluation, inquiry, etc., in order to make proper determinations (e.g., priority of required actions) (3.3)

- Survey and evaluate accident scenes and incidents
- Evaluate crime scenes to determine investigative procedures and assistance necessary
- Analyze and compare cases for similarity of modus operandi

REVIEW AND RECALL OF INFORMATION - involves the review and study of information for later recall such as regarding wanted persons and vehicles (3.3)

- Review information on known criminals and criminal activity
- Identify from memory wanted vehicles or persons
- Review reports and notes to prepare for testimony at trials

CHEMICAL, DRUG, AND ALCOHOL TESTING - involves physically or chemically testing for sobriety and/or presence of controlled substances (3.4)

- Administer physical roadside sobriety and "breathalizer" tests
- Use chemical test kits (e.g., Valtox, Narco-Ban) to test for controlled substances
- Arrange for obtaining blood or urine samples for sobriety tests

FINGERPRINTING/IDENTIFICATION (2.9)

- Dust and lift latent fingerprints
- Make fingerprint comparisons
- Fingerprint prisoners and other persons

SECURE AND PROTECT PROPERTY - involves making secure and protecting such things as accidents scenes, vehicles, homes and property (includes use of extinguisher) (3.5)

INSPECTING PROPERTY AND PERSONS - involves examining, searching, checking and inspecting buildings, people, vehicles, objects, etc.- includes use of flashlights, spotlights and strolometers to measure distances (3.1)

- Examine dead bodies for wounds and injuries to determine nature and cause of death
- Examine dwellings for signs of illegal entry
- Examine suspicious or potentially dangerous objects (e.g., suspicious packages, downed high tension wires)

SEARCHING - involves search of buildings, persons, vehicles, etc., and the search for missing, wanted, or lost persons, evidence, etc. (3.6)

- Pat search suspects
- Physically search properties and vehicles for contraband, criminal activity, wanted subject, or evidence
- Search, collect, and examine evidence from accident/crimes

LINEUPS - organizing and conducting lineups and photo lineups (3.2)

TABLE 2: Patrol Officer Physical Job Demands (1985)

All frequently reported physical demands are listed. These physical demands were found to be required in the service of both critical and noncritical incidents.

1. ***Running***

Distance: median and mode - 161 yards; maximum - 500+yards;
Speed required in almost all (89%) of cases;
Obstacles encountered 60% of time - most commonly:
- fences and walls
- shrubs
- vehicles

Most often performed in conjunction with encountering resistant subjects and/or jumping, climbing;
Average duration - 4+ minutes

2. ***Resisting Combative Subjects***

Most common physical peace officer activity (50% of instances);
Weight of resisters: mean - 165 lbs, mode - 180 lbs; max - over 220 lbs. (avg. height - 6 ft.);
Number of resisters: 1 (92%) to 3 (2%);
62% of resisters on drugs/alcohol.

Common resistances offered:
- Pulling away
- Wrestling
- Hitting/kicking
- Running away
- Passive resistance
- Pushing/shoving

Common actions taken by officer:
- Grasping and moving
- Takedown wrestling
- Wrist, head or arm locks
- Pushing/shoving
- Dragging/pulling
- Handcuffing

One-third performed without assistance;
10% of these activities performed without assistance and after running (avg. - 200 yds., max - over 400 yds.);
Average duration - 3+ minutes.

3. ***Balancing***

Width of surfaces: mode - 6", mean - 14";
Distance traveled: mean - 31', max. - over 140';
Distance from ground: avg. - 5', max - over 8';
Types of surfaces: Block walls, Mountains/hillsides, Fence tops, Roofs, Ledges, Garbage cans
80% of balancing performed in conjunction with climbing;
Average duration - 6 minutes;
Speed required in 28% of instances.

4. ***Climbing***

Object Climbed	Height Mean	Height Mode	Height Max.	Avg. Distance Run In Conjunction With Climb*
Fences/walls	7'	6'	16'	230 yds.
Ladders	20'	20'	35'	120 yds.
Stairs (flights)	2	1-2	5	120 yds.
Embankments	36'	10'	75'	120 yds.

Speed required in 33% of instances;
Average duration - 4+ minutes.

*Running required in conjunction with climbing in approx. 1/3 of instances.

5. **Moving Nonresistant Persons or Objects** (Includes motions such as dragging, pulling, lifting, carrying and supporting)

A. Moving persons

Weight: mean - 170 lbs., mode - 180 lbs, max. - over 250 lbs;
Distance: avg.- 40 ft., mode - 10 ft., max. - over 100 ft.;
94% of persons moved were conscious;
68% of persons moved were intoxicated;
Speed required in 40% of instances;
Performed without assistance at least 30% of time;
Persons lying down 85% of instances;
Movement of persons most commonly required lifting under arms, around trunk, or by both arms;
Average duration - 4 ½ minutes.

B. Dragging/pulling objects

Weight (unassisted) mean - 60 lbs, mode - 20 lbs.; max - over 100 lbs.;
Weight (assisted) mean -780 lbs, mode - 150-200 lbs., max - 1000 lbs.;
Distance: mean - 27 ft., mode - 6 ft., max - over 35 ft.;
Performed without assistance 80% of instances;
Speed required in 60% of instances.
Average duration - 3+ minutes

C. Lifting/carrying objects

Weight: avg. - 40 lbs, max - over 100 lbs.;
Items: boxes, lumber, furniture, sand bags, tire wheels;
Performed without assistance 85% of time;
Lifted from ground (70%), waist height (22%), shoulder (6%) and above head (2%);
Average duration - 6 minutes.

D. Pushing objects

Most common object pushed: vehicles;
Weight: mean - 3000 lbs, mode - 2000 lbs., max - over 5000 lbs.;
Distance: mean -58 ft., mode -50 ft., max - over 150 ft.;
Performed with assistance over 60% of time;
Speed required 50% of time;
Average duration - 2 minutes.

6. ***Jumping/Hurdling/Vaulting***

Most common object jumped: fences and walls

Direction	Distances Mean	Mode	Max.
Up	39"	36"	72"
Down	51"	72"	96"
Across	35"	36"	60"
Over	36"	24"	72"
Vaulted	56"	72"	72"

Speed required 90% of time;
Performed 66% of time while moving forward, 33% from stationary position;
Performed most commonly in conjunction with running and climbing;
Average duration - 4 ½ minutes.

TABLE 3:
Patrol Officer Rates of Critical Physical Activities by Type of Activity (1992) (N=377)

Type of Activity	Per Year Frequency*
	Mean
Combative Incidents	
Handcuffing	79.7
Using restrain device	2.4
Using baton	2.0
Using locks, grips, holds	10.4
Self-defense	1.8
Using body force	1.3
Emergency Response Incidents	
Running	10.6
Lifting/carrying	4.9
Dragging/pulling	2.4
Climbing	6.9
Crawling	2.2
Jumping	2.9
Balancing	2.9
Pushing	2.4
Other	1.8
Overall Physical Incident Rate	**110.7**

*Based on an estimated average of 221.3 shifts per year.

D. POST 1998 Entry-Level Patrol Officer Job Analysis (Table 4)

In 1998, POST conducted a patrol officer task analysis, surveying 1713 police officers and 611 patrol supervisors across 63 California agencies. There were 317 core tasks identified in the survey. These tasks were grouped into essential job functions. Comparison to the 1978 job analysis indicated that the core tasks for this position have remained stable over the last twenty years.

Table 4 lists those essential functions that are relevant to medical screening, along with a sample of tasks within each function. Also depicted are all tasks identified that involve physical activity and physical force.

E. Environmental Factors and Working Conditions That Can Be Associated with the Patrol Officer Job (Table 5)

Working conditions and environmental factors can also have a direct impact on the ability of a candidate with a disability to perform as a patrol officer. Table 5 provides a list of contextual factors that may have an impact on the medical screening of patrol officer candidates. This list, however, is not based on a job analysis, and therefore no data exists as to either the prevalence or consequence associated with any of these factors. Rather, it is provided to assist employers in identifying their own agency-specific job conditions and environmental considerations.

TABLE 4:
Entry-Level Uniformed Job Analysis (1998)

I. Job Functions and Tasks

Detecting and Investigating Crimes
- conduct surveillance of individuals, vehicles, or locations
- interview victims, suspects, and witnesses
- collect and identify evidence and property
- seize contraband and/or evidence.

Apprehending and Arresting Suspects
- obtain, verify, and executing arrest warrants
- conduct high risk/felony vehicle stops;
- use weapons;
- detain, search and handcuff suspicious persons;
- subdue and disarm resisting or attacking persons;
- transport, book, and handle prisoners.

Preparing for and Presenting Legal Testimony
- give legal testimony
- appear in court as a designated investigating officer

Managing Traffic
- observe traffic and identify, cite/arrest and book Vehicle Code violators
- conduct traffic stops and roadside sobriety tests
- direct traffic
- secure, manage, and investigate traffic accident scenes and hazardous roadway conditions

Providing Emergency Assistance to the Public
- engage in high speed driving in response to emergencies and escort emergency vehicles
- move, assist and transport persons in need of emergency assistance
- administer first aid moving/assisting incapacitated persons; and

Maintaining Order in the Community
- mediate disputes and quell disturbances;
- use verbal persuasion to encourage compliance assessing
- crowd/riot control

Advising and Assisting the Public
- assist persons with disabilities;
- calm emotionally upset persons

Working with the Community to Reduce Crime and Address Concerns
- conduct security inspections of businesses and dwellings;
- work with community members to reduce crime and address concerns;

Maintaining and Improving Job Readiness
- participate in physical fitness programs;
- engage in required practice with firearms and other service weapons;

Performing Routine Patrol Activities
- drive police vehicle in adverse or poor conditions
- perform physical work such as lifting, climbing, reaching, etc.

Table 4 continued on next page.

TABLE 4:
Entry-Level Uniformed Job Analysis (1998) (Continued)

II. Tasks Involving Physical Activity and Physical Force

Pursue on foot fleeing suspects

Subdue resisting or attacking persons using locks, grips, or control holds (excluding mechanical devices).

Use compliance or come-along holds to move persons.

Use hands or feet in weaponless defense.

Physically disarm persons.

Lift and/or carry hard-to-move objects or persons.

Climb up over obstacles or through openings (e.g., fences, walls, windows).

Jump/hurdle/vault over or across obstacles (e.g., bushes, low fences, ditches).

Balance oneself on uneven or narrow surfaces (e.g., roofs, ledges).

Sit in one position for extended periods of time.

Stand in one position for extended periods of time.

Walk for extended periods of time (e.g., foot patrol).

Drag and/or pull hard-to-move objects or persons.

Crawl in confined spaces or low areas (e.g., attics, culverts).

Push hard-to-move objects by hand (e.g., disabled or abandoned vehicles).

Use body force to gain entrance through barriers (e.g., locked doors).

Hold or support heavy objects (e.g., equipment, disoriented/injured persons).

Reach overhead to retrieve objects.

Jump down from elevated surfaces.

Squat, crouch, or kneel (to conduct person/vehicle searches, collect evidence).

Bend or stoop (to conduct person/vehicle searches, collect evidence, etc.).

Climb ladders/stairs.

TABLE 5:
Environmental Factors and Working Conditions That Can Be Associated With Patrol Officer Job Duties

1. Exposure to the following atmospheric conditions:

   Direct sunlight
   High temperatures (above 95 degrees)
   Low temperatures (below 30 degrees)
   Sudden temperature changes (more than 30 degrees)
   Humidity (high or low)
   High or low air pressure conditions
   Snow and ice
   High winds

2. Exposure to the following irritants:

   Dust
   Allergenic substances (e.g., bee stings, pollens, animal dander)
   Other toxic/poisonous substances (e.g., pesticides, herbicides, EDB, PCB, carbon monoxide, fingerprint powder, chemical irritants, chemical agents)

3. Adverse physical surroundings:

   Slippery surfaces (e.g., chasing suspect through wet grass, or over rain-slicked roofs)
   Working above floor level (e.g., roofs, fences)
   Extreme vibrations (from exposure to equipment or machines as might occur while directing traffic, or from sudden jerks or jars as might occur while subduing combative suspect)
   Confined areas or work that requires awkward or confined body positions

4. Adverse vision and hearing conditions:

   Poor lighting (e.g., glare, night vision conditions)
   Fog
   Noise (e.g., activated alarms, wailing sirens, gunfire)
   Faint sounds
   Other poor auditory conditions (e.g., distracting background noise)

5. Adverse working conditions:

   Irregular/extended work hours (including frequently fluctuating work hours and rotating shift work)
   Job pressure/tension
   Prolonged sitting

F. The Prevalence and Impact of Job Stress on the Patrol Officer Position[1]

One of the more intangible yet pervasive components of police work is job stress. In fact, police work has often been implicated as one of the most stressful occupations in the world. The patrol officer is constantly exposed to aggression, violence, and cruelty, and must frequently intervene in high-pressure, human crisis situations. It is one of the few occupations in which individuals are continually asked to face danger and put their lives on the line at any moment (Spielberger, et al., 1981). Patrol officers have a great deal of authority, are empowered to use deadly force, and must anticipate personal harm (Ellison and Genz, 1983). They must make critical decisions with little time for deliberation (Sigler & Wilson, 1988). They face a continual conflict between the instinctual tendency to avoid hazard and the obligation to face up to risks (Territo & Vetner, 1981).

[1]The impact of job stress is also discussed in the Gastrointestinal System.

In addition to the inherent dangers of police work, law enforcement officers are influenced by a variety of organizational stressors resulting from the administrative and professional requirements of the job. Topping the list is the autocratic, often rigid structure of law enforcement agencies, which can alienate and frustrate the patrol officer, as well as hinder communication and create feelings of non-support (Ayres, 1990; Brooks & Piquero, 1998). Shift work, common among police agencies, can result in chronic fatigue, deterioration of job performance, gastrointestinal and sleeping difficulties, as well as significant changes in the officer's lifestyle and domestic patterns (Villa, 1996; and Villa & Taiji, 1999). Staff shortages, work overload, tedious tasks and equipment failure are not uncommon (U.S. Department of Justice, 1997) and can lead to mental, emotional, and physical exhaustion (Figely,1999; Stack & Kelley, 1994).

Patrol officers must also deal with feelings of fear and hatred from a non-supportive, often-hostile public, and must respond to provocations with self-control, patience and compassion (Spielberger, et al., 1981). Added to their stressors is a criminal justice system which is often seen by officers as non-supportive (Brooks & Piquero, 1998; Stevens, 1999).

The stress faced by patrol officers comes in many forms: acute (e.g., high order emergency situations), chronic (day-to-day routine nature of the job), psychological (e.g, frustration with the criminal justice system), physiological (e.g., taxing nature of shift work; infrequent but rigorous physical demands), external (e.g., frustration with the justice system), internal (excessive paperwork; restrictive administrative policies) and stressors found in police work itself (e.g., role conflict between enforcement and providing service to the community).

Acute stressors, although less common, can have a significant impact on the officer. The more common acute stressors that officers can experience include a child's death or abuse, being involved in a shooting, a fellow officer's death/injury and gruesome scenes such as multiple deaths from vehicle accidents. Experiencing these acute stressors can lead to symptoms commonly found in an Acute Stress Disorder (such as sleep disturbances, intrusive flashbacks and recurring thoughts, and feelings of anxiety, anger and/or depression) and sometimes can lead to a Posttraumatic Stress Disorder (Gentz, 1994; Solomon & Horn, 1986; Stevens, 1999). Approximately fifty-five percent of officers will encounter at least one acute stressor within the first five years on the job (Gentz, 1994).

The impact of psychological job stress is evident by the sizable proportion of police worker's compensation claims that involve anxiety reactions and other mental disorders (counting for approximately 7% of disability claims according to the California Department of Industrial Relations). Furthermore, although precise figures are not available, a high incidence of alcohol abuse among police is not an infrequent finding (Hurrell & Kroes, 1975; Violanti, et al., 1983; Hageman, 1982). Yet another indication of the psychological demands of the job are the suicide rates of patrol officers, which run significantly higher than many other occupations, with standardized mortality ratios (SMR) of 133+ (Somoderilla, 1978; Lester, 1978).

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GENERAL GUIDELINES FOR USING THE MEDICAL SCREENING MANUAL[1]

The medical protocols in this manual are intended to provide physicians with detailed guidance on the medical examination and evaluation of entry level patrol officer candidates. Although these protocols were written to be self-explanatory for the medically qualified manual user, this section offers general principles and guidelines to ensure that the protocols are implemented in an effective, efficient, and lawful manner. Moreover, unlike the protocol chapters themselves, which were developed primarily for use by physicians, the following guidelines were written for both physicians and hiring authorities.

1. Avoid slavish adherence to the guidelines and recommendations in the manual.

The examination and evaluation protocols in this manual are offered as guidelines, not standards. Although they provide concrete guidance pertaining to a wide range of conditions and circumstances, the medical protocols are intended to permit (in fact, to foster) the individualized assessment of each candidate.[2] The physician is therefore responsible for the appropriate use and interpretation of the guidance herein, based on the facts and specifics of each candidate's medical status and history.

Users of the manual may find that some of the recommended screening tests and protocols are not currently performed as part of their pre-placement examination (e.g., sigmoidoscopic examinations for everyone over 50). The expense of a procedure was considered in the decisions of the medical specialty panels; nevertheless, an agency may rightfully determine that a particular test is unnecessarily costly, time-consuming, or otherwise impracticable. Therefore, it is up to each agency to review these protocols (and their associated rationales) with their medical consultants to determine the need for and appropriateness of each recommended test and procedure prior to the wholesale adoption of these guidelines.

2. Properly partition the roles of screening physician and hiring authority.

A critical but commonly overlooked aspect of pre-placement medical screening is the need to partition the roles of the screening physician and the hiring authority. Although they work together, each must be aware of the extent and limits of their own (and each other's) responsibilities.

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[1] Author: Shelley Weiss Spilberg, Ph.D.

[2] Details on the conduct of individualized assessment can be found in "Pre-Employment Medical Screening and the Law."

As depicted in Table 6, the employer is initially responsible for providing the physician with a complete, accurate, and medically relevant description of the patrol officer job demands and working conditions at that agency.[3] Physicians, in turn, are responsible for ensuring that their examinations and recommendations are based on full familiarity with these job demands and conditions.

TABLE 6: Role of the Physician and the Employer in the Medical Screening Process

	Physician	Employer
Job Information	Be familiar with job information supplied by employer; ensure all considerations and decisions are job relevant	Defines/identifies job duties and working conditions for that agency
Risk Evaluation	Quantifies/describes risks in terms of likelihood, severity, imminence, etc.	Makes ultimate determination of whether risk(s) posed by candidate constitute a "direct threat"
Reasonable Accommodation	Identifies work restrictions; suggests practices, aids, or devices that would allow candidate to perform job; monitors compliance as necessary	Working with candidate and physician, chooses method of reasonable accommodation (or rejects due to undue hardship); monitors compliance as necessary
Decision Making	Advises employer of candidate's ability to perform specific job tasks and/or risks associated with job performance	Makes ultimate decision as to whether to hire, disqualify, defer, or restrict

Physicians and employers also have complementary roles with regard to candidate risk evaluation. The physician must determine if the candidate can physically perform the essential duties of the position, as well as provide the employer with a description (and quantification, to the extent possible) of the candidate's performance limitations and/or the risks if the candidate were to be placed on the job. Based on this information, the employer is then responsible for deciding whether the risks described by the physician constitute a direct threat, and for other judgments leading up to and including the ultimate hiring decision.

Prior to making this determination, however, available methods of reasonable accommodation that could serve to reduce this risk to a tolerable level must be considered by both the physician and the employer. The physician's role here should

[3] See "Patrol Officer Job Demands: Their Implication for Medical Screening" for a generic peace officer job description as well as guidance on how to conduct an agency-specific job analysis.

involve the identification of procedures, devices, job aids, medicines, or work restrictions that would allow the individual to perform job functions without undue risk. There are many examples of possible accommodations mentioned throughout the manual, including medication monitoring systems, pre-placement contracts with candidates in which they promise compliance with their prescribed medication regimen, use of corrective devices, etc.

Here again, it is the employer who is responsible for: (1) ensuring that the affected job duty is an essential one; and (2) selecting an accommodation (preferably after conferring with the candidate on his/her needs and preferences), or rejecting an accommodation based on undue hardship; and (3) making the ultimate selection decision.

3. **Tailor the examination to the specific needs of each candidate.**

All patrol officer candidates should receive the same basic medical examination. However, as indicated in the protocol chapters themselves, physicians should conduct more in-depth tests as necessary when an initial condition of concern is identified. It is imperative that a sufficient amount of information be accrued to warrant an ultimate hiring recommendation -- a "good faith" belief alone that a candidate cannot perform the job is neither sufficient nor legally defensible.

4. **Collect information from other parts of the patrol officer screening process, as necessary.**

Depending upon their order of occurrence, information gleaned from other parts of the patrol officer screening process, such as the background investigation or physical ability test, can provide the physician with valuable supplementary information regarding a candidate's medical status and history. In addition, in instances where a candidate manifests certain physical limitations (e.g., a missing finger), the physician may want to recommend a non-routine, task-specific evaluation (e.g., firearms assessment).

5. **Consult with and/or gather information from other medical experts, as necessary.**

Prior to disqualifying a candidate, or when uncertain as to the degree of threat posed by an individual, it is often advisable for the screening physician to consult with the candidate's personal physician, who typically has a more extensive health history that can aid in making employment recommendations. At times, it may also be appropriate (and even cost efficient) to refer a candidate to a specialist for evaluation. This is especially true in cases where: (1) the candidate displays a relatively rare medical condition, or a relatively unique manifestation of a more common condition; (2) the evaluation requires physical examination skills that are beyond the specific expertise of the examining doctor; or (3) when there is disagreement between the screening

physician and the candidate's personal physician. The added weight of an additional medical opinion, particularly that of a specialist, may also prove useful in defending an employment decision.

6. **Make sure that medical recommendations and decisions are consistent with legal standards.**

Both physician and employer must be keenly aware of the legal standards imposed on pre-employment medical screening by both state and federal law. These risk standards (as described in "Pre-Employment Medical Screening and the Law") do not allow for consideration of future costs attributable to sick leave, workers' compensation, or pension benefits. Moreover, fair employment laws prohibit consideration of the candidate's medical status beyond the immediate (i.e., 2-3 year) future.

7. **Limit access to information regarding the candidate's medical status.**

As discussed in "Pre-Employment Medical Screening and the Law," information revealed during the course of medical screening is to be treated as confidential, and maintained in records separate from the candidate's personnel file. Although hiring authorities are permitted access to these records, it is advisable to limit the information conveyed from physician to employer to only that which is necessary for making employment-related decisions (see "Instructions to Physicians" on the Medical Examination Report -- Appendix D). Limiting information in this way can head off accusations of unfair treatment attributed to an individual's disability status.

8. **If a medical screening decision results in a job denial or restriction, fully explain the reasons to the candidate.**

A rejection without a complete explanation can create a feeling of unfairness on the part of the candidate. In fact, one of the primary reasons behind the ADA's prohibition against pre-placement medical inquiries is the elimination of the common practice of presumptively disqualifying disabled job applicants without disclosing to them the basis for the rejection. It is therefore advisable to provide the candidate with a full, task-specific explanation of the bases for any adverse decision, be it disqualification, work restriction, or deferral. In addition, if the results of the medical examination result in a disqualification, the candidate must be permitted to submit independent medical opinions for consideration before a final determination is made. Besides being required by law (2 Cal. Admin. Code, Div.4, 7294(d)(2)), an in-house appeal process generally provides the employer with a more attractive alternative than the investigation and arbitration that can ensure if the candidate has no recourse but to file a discrimination claim with a state and/or federal regulatory agency.

CARDIOVASCULAR SYSTEM[1]

I. INTRODUCTION

A. OUTLINE OF CONDITIONS COVERED

The cardiovascular system can be divided into the following groups of disorders to facilitate consideration of functional capacity and the ability to perform the duties of a patrol officer.

GROUP	EXAMPLES OF GROUPS
Arrhythmias	PVCs, Atrial Fibrillation, Heart Block, PAT, Brady/Tachy, WPW, Pacemaker
Valvular Disease	Mitral Valve Prolapse, Rheumatic Valve Disease, Bacterial Endocarditis, Congenital Valve Disease
Congestive Failure	Cardiomyopathy, IHSS
Inflammatory Disorders	Myocarditis, Pericarditis, Endocarditis
Coronary Disease	CABG, Angioplasty-Atherectomy, Myocardial Infarction, Angina
Hypertension	All Levels of Control

The examination and evaluation protocol described in this section organizes the above cardiovascular conditions into those that cause: (1) symptomatic heart disease; (2) asymptomatic heart disease; or (3) produce abnormal test results. A separate section on hypertension is presented.

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[1]Author: Stephen G. Weyers, M.D.
Specialist Review Panel: Lee Cady, M.D.; Robert Holly, Ph.D.; Tissa Kappagoda, M.D.; John Rutledge, M.D.; Jeffrey Tanji, M.D.

B. IMPLICATIONS FOR JOB PERFORMANCE

The patrol officer position includes a variety of physically and emotionally demanding job duties that have a significant impact on cardiovascular functioning. Patrol officers engage in vigorous activities requiring above-average degrees of fitness and cardiovascular reserve, such as:

- running up to 500 yards at full speed;
- moving incapacitated persons and other heavy objects in excess of 100 feet; and
- subduing combative subjects after pursuit running.

Aerobic capacity refers to the maximum amount of oxygen an individual can consume within a given period of time (VO_2 max). The aerobic capacity needed to perform law enforcement tasks such as wrestling can easily be 40-41 ml/kg/min., or 12 METS (see Respiratory chapter). In fact, extremely vigorous activities, such as pursuit and combat with multiple suspects, or running up an embankment or several flights of stairs, may require an even higher degree of aerobic capacity.

The amount of time that a person can continuously perform work at a given oxygen requirement depends upon the percent of the person's VO_2 max needed to do the job and his/her state of conditioning. The average person can work at his/her VO_2 max for approximately 1-3 minutes; at 80% of his/her VO_2 max for 15-30 minutes, etc. An individual's oxygen requirements must be considered in light of the fact that physically demanding patrol officer activities have been found to be in excess of two minutes in duration.

II. MEDICAL EVALUATION AND EXAMINATION GUIDELINES

A. GENERAL SCREENING RECOMMENDATIONS

Candidates with heart disease must be individually considered to determine their diagnosis, prognosis, and functional capacity. This information should be evaluated to determine if candidates can perform patrol officer duties in a safe and efficient manner without exacerbating their cardiac condition.

1) History:

See Medical History Statement. Syncope, chest pain, dizzy spells or loss of balance, and other symptoms of cardiovascular disease require complete evaluation to determine cause and risk of recurrence.

2) Examination:

The physical examination should include an evaluation for signs of congestive heart failure (e.g., edema, rales, and increased jugular venous pulse), assessment of the heart sounds and rhythm, and a characterization of all supplemental sounds and murmurs.

All candidates should have their blood pressure measured in the sitting position. The cuff should be properly zeroed and should be at least as wide as 2/3 of the length between the antecubital fossa and the axilla, and should wrap around the arm at least 1 1/2 times (Kirkendall, et al., 1980; Frohlich, et al., 1987). Elevated values require repeat testing to determine reliability.

3) Routine Tests:

All candidates should have a resting EKG and chemistry panel to identify those in need of lifestyle modification to delay onset of cardiovascular disease. While routine tests should not be used to qualify or disqualify candidates, they are useful in determining the need for exercise testing and lifestyle modification.

B. EVALUATION OF COMMON CLINICAL SYNDROMES

1) DIAGNOSED HEART DISEASE - SYMPTOMATIC:

Cardiovascular symptoms, such as chest pain, fatigue, and shortness of breath or dizziness, indicate a decrease in the heart's functional capacity in terms of its ability to successfully meet the body's requirement for oxygenated blood.

The New York Heart Association system (1963) for classifying cardiovascular diseases includes both functional (Table I-1) and therapeutic (Table I-2) categories. As indicated

in these tables, functional classes II - IV are symptomatic with activity, and therapeutic classes B - E require restricting activities to those that involve less than maximal exertion. Therefore, individuals falling within either of these classification ranges would be unable to safely perform the more strenuous patrol officer activities (e.g., subduing combative subjects, running 500 yards). For example, the functional classification (representing the heart's ability to deliver an adequate amount of oxygenated blood to the body) indicates that those in Class II are unable to perform activities that require a maximum oxygen consumption of more than 22 ml 0_2/kg/min. (6 METS). Since activities such as wrestling require performance at a level of 12 METS or greater, a Class II individual would be unable to safely perform these activities (Sidney & Blumchen, 1990).

TABLE I-1
New York Heart Association Cardiovascular Classification System
Functional Classification

Class I:	Ordinary physical activity does not cause fatigue, palpitation, dyspnea or anginal pain. Maximum oxygen consumption is 22 ml or more 0_2/kg/min.
Class II:	Cardiac disease results in slight limitation of physical activity. Maximum oxygen consumption is 16 ml to 22 ml 0_2/kg/min.
Class III:	Cardiac disease results in marked limitation of physical activity. Maximum oxygen consumption is 10 ml to 16 ml 0_2/kg/min.
Class IV:	Cardiac disease results in inability to do any physical activity without discomfort. Maximum oxygen consumption is less than 10 ml 0_2/kg/min.

Adapted with permission from Criteria Committee of the New York Heart Association. 1964. Diseases of the Heart and Blood Vessels: Nomenclature and Criteria for Diagnosis, 6th ed. Boston: Little Brown and Company.

TABLE I-2
New York Heart Association Cardiovascular Classification System
Therapeutic Classification

Class A:	Individuals with cardiac disease whose physical activity need not be restricted.
Class B:	Individuals with cardiac disease whose ordinary activities are not restricted, but are advised against competitive or severe efforts.
Class C:	Individuals with cardiac disease whose physical activities should be markedly restricted.
Class D:	Individuals with cardiac disease whose physical activities should be severely restricted.
Class E:	Individuals with cardiac disease whose physical activities should be at complete rest in a chair or bed.

Adapted with permission from Criteria Committee of the New York Heart Association. 1964. Diseases of the Heart and Blood Vessels: Nomenclature and Criteria for Diagnosis, 6th ed. Boston: Little Brown and Company.

2) DIAGNOSED HEART DISEASE - ASYMPTOMATIC:

It is occasionally necessary to recommend that asymptomatic individuals with heart disease limit their activities to those that require no more than moderate dynamic or static exertion (6 METS) (Cheitlin, et al., 1985). For example, IHSS is an important cause of sudden death in young adults; it is therefore recommended that individuals with this condition limit their activities to those equivalent to low intensity sports (i.e., those with low dynamic and low static demands: 3-4 METS; Mitchell, et al., 1985).

Consideration must be given to the individual's ability to withstand the sympathetic assault associated with recurrent emergency responses to life-threatening situations. Asymptomatic individuals require testing to determine their functional capacity and associated risks. Echocardiography might reveal, for example, that an individual with IHSS has marked left ventricular hypertrophy or evidence of significant obstruction of left ventricular outflow. Ambulatory monitoring may show significant cardiac arrhythmias, and cardiac stress testing may reveal inappropriate blood pressure response, arrhythmia, cardiac ischemia, or poor physical conditioning.

3) NO CONDITION DIAGNOSED, BUT ABNORMAL FINDINGS OR RISK FACTORS:

Occasionally, routine testing identifies an individual with no diagnosed condition but abnormal test results. It is common to find individuals with occasional PVCs, abnormal heart sounds, or a mild heart murmur, the significance of which is unknown. Individuals who present with such findings require further diagnostic testing to determine if functional impairment or risk of sudden incapacitation is present. Examples include: hypertension with left ventricular hypertrophy, IHSS, severe three vessel disease or high grade stenosis of the left main coronary artery, cardiomyopathy with decreased ejection fraction, recurrent ventricular tachycardia, aortic stenosis, and significant valvular insufficiency.

C. RECOMMENDED EVALUATION PROTOCOL

Individuals with cardiovascular disorders or those with abnormal findings usually present a clear picture of the types of activity that can or cannot be performed. Work and recreational activity should be discussed completely to determine whether symptoms are present at rest or with activity. Recency, intensity, duration, frequency, and the type of activities should be documented. Medications taken in the past or at present require consideration of side effects. Cardiac medications may cause dizziness, paresthesia, incoordination, change in mental status, or weakness and fatigue (Kruyer & Hickman, 1990). Beta blockers may effect maximal exercise capacity and compromise performance during a critical incident.

Candidates with a known cardiovascular disorder should submit copies of medical records for review. Date of onset and progression of the disorder, response to treatment(s), and examples of functional ability are often available from these records.

When baseline testing presents abnormal results without concomitant symptoms, risk factors for cardiac disease such as smoking, diabetes, hypertension, high cholesterol, and family history of heart disease before age 55 should be reviewed.

Some or all of the following tests should be considered to determine functional ability:

1. Exercise EKG - Maximal Exercise Testing: Normal fitness without arrhythmia, ischemic change or hypertensive response should be present. Table I-3 demonstrates the relationship between functional class, METS, oxygen requirements, and level of exercise. (As discussed earlier, the more demanding patrol officer activities require the ability to exercise at 12 METS.) If blood pressure increases to greater than 200 systolic or 100 diastolic during or after exercise, an echocardiogram is recommended to rule out left ventricular hypertrophy.

   Note: In cases where a standard exercise EKG is not helpful (such as when LBBB or LVH are present, or when the exercise EKG is ambiguous) a Thallium treadmill should be performed.

2. Echocardiography: Valvular disease, decreased ejection fraction, hypertrophy, or chamber enlargement confirms the presence of significant cardiovascular disease that will limit the candidate's ability to safely engage in strenuous police activities. Color flow doppler may be helpful in determining the functional significance of valvular abnormalities.

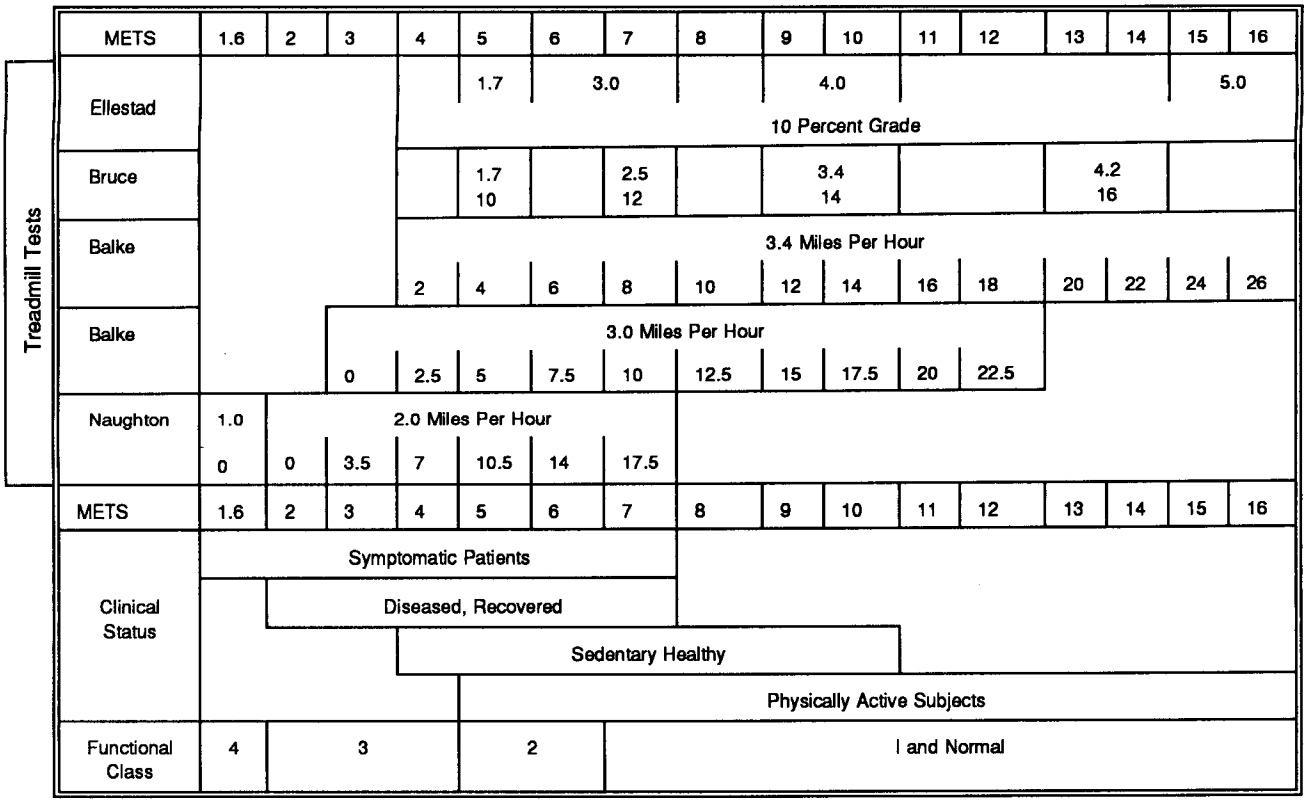
3. Holter monitor (24 hr.): No complex arrhythmia or arrhythmia that may be associated with fatigue, dizziness or loss of functional ability should be found. Candidates with frequent premature beats require diagnostic testing to establish the cause of the arrhythmia and to determine functional limitations and therapeutic regimen.

4. Exercise 2D Echo: Sensitivity of 61-86%; specificity of 75-100% for myocardial ischemia (decreased E.F./ segmental wall motion changes).

5. Electrophysiologic Study: Symptoms of arrhythmia, documented arrhythmia, or conditions such as WPW require specific study to determine the nature of the arrhythmia and the risks posed by the condition.

6. Cardiac Catheterization: Catheterization study may be required to demonstrate patent arteries to all regions of the heart when other studies are not diagnostic, when history suggests intermittent spasm, or when there is a history of coronary disease or previous surgery.

TABLE I-3
Relationship of METS and Functional Class According to 5 Treadmill Protocols



In the Ellestad protocol, the numbers in the boxes are miles per hour (mph); in the Bruce protocol the top numbers are mph and the bottom numbers are the percent grade. In the Balke and Naughton protocols the numbers are the percent grade. Adapted with permission from Fox, S.M. III, Naughton, J.P., and Haskell W.L. 1971. Physical activity and the prevention of coronary heart disease. Annals of Clinical Research. 3:404-432. Copyright 1971 The Finnish Medical Society Duodecim.

In conclusion, candidates with cardiovascular disease must be symptom-free to perform the more strenuous job duties of patrol officer. Moreover, even asymptomatic individuals with cardiovascular disease may be found to lack the physical capacity to perform the required job duties, or may be therapeutically restricted from performing maximal physical activities. Therefore, it is imperative to use functional testing to ensure that job-related physical activities can be performed in a manner safe to both the individual and the public.

III. HYPERTENSION

Three or more blood pressure readings above 90 mmHg. on successive examination days are required to make a diagnosis of hypertension. Blood pressure levels as classified according to the diastolic reading (the most frequently used classification method) are defined as: Mild 90 - 104 mmHg.; Moderate: 105 - 114 mmHg.; Severe: 115 mmHg. and above. Systolic hypertension refers to systolic blood pressures consistently above 140 mmHg. (Frohlich, et al., 1987).

Hypertension is the most common disease affecting the heart and blood vessels. Essential hypertension (i.e., no known cause) affects an estimated 60 million adults in the United States (Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure, 1984). Other forms of hypertension are relatively uncommon (5-10% of cases) and can be hormone related or associated with diseases of the kidney. While most individuals with essential hypertension can achieve control pressures (below 90 mmHg.) through diet, exercise, behavior modification and medication, there is no cure for the disease and control becomes a lifelong effort. After normal levels of pressure are achieved, it may be possible to reduce the amount of medication, but rarely is it possible to discontinue treatment altogether (Schmieder, et al., 1991).

A. GENERAL CONSIDERATIONS

Stressors:

Certain psychological situations and physical activities are particularly dangerous for the hypertensive individual. Job stress, such as situations in which the individual is "caught in the middle" may produce or exacerbate high blood pressure (Ely & Mostardi, 1986).

Physical activities that demand repeated high levels of static strength until fatigue halts the activity can produce acute blood pressure elevations and, when left ventricular dysfunction is present, can result in serious cardiac dysrhythmias. Blood pressure elevations can be more extreme and sustained for those with hypertension than for the non-hypertensive under the same circumstances (Zabetakis, 1984). Strenuous patrol officer activities, such as pushing vehicles, lifting heavy objects, moving incapacitated persons, and subduing combative subjects are likely to worsen hypertension (Mustacchi, 1990). Situations that cause a threat to life, fear of severe bodily harm, serious confrontational situations, and/or responsibility for the life and welfare of others are among those that have been identified as maximally stressful to individuals (Graham, 1945).

Complications:

The complications of hypertension can be severe and even fatal. Severe hypertension can cause cerebral edema, headache, vomiting and stroke. The degree of

hypertension can rapidly progress to severe levels as a result of physical or mental stress. Aggravation of hypertension can cause irreversible and rapidly progressing damage to the arteries of the heart, brain or kidneys, leading to heart attack, stroke or kidney failure.

The prognosis of untreated hypertension is extremely poor. Mortality is increased with the severity of hypertension. The average diastolic blood pressure in men at age 45 years is 78 mmHg.; the mortality rate of this group is 300% greater than normal if average pressure is elevated to 152/95 (mild hypertension) and remains untreated. Blood pressure, rather than age, appears to be a more significant factor in the mortality rate. By the time a typical hypertensive individual develops complications, s/he has already survived three-fourths of his/her hypertensive life span.

It has been demonstrated, however, that treatment of even mild hypertension makes dramatic changes in prevention of major morbidity and mortality from stroke, heart disease, kidney failure, and retinal disease.

Medication:

Use of anti-hypertensive medications commonly produces side effects that vary in nature and severity. Multiple effects may be experienced by an individual as additional medications are required to achieve control (Croog, et al., 1986).

Commonly experienced side effects include sleepiness, fatigue, dizziness, cough, severe nasal stuffiness, gout or hypotension from over treatment. Problems of control result from patients discontinuing medication because of side effects. Additionally, mild to moderate hypertension is often asymptomatic, leading many individuals to discontinue medication or to ignore other treatment programs (Cramer, et al., 1989).

B. RECOMMENDED EVALUATION PROTOCOL

All candidates should be questioned regarding the onset of their hypertension, events associated with high readings, current and past medications, side effects from medication, and family history of hypertension. Compliance with prescribed medical treatment should be verified.

Candidates with hypertension requiring medication for control should have their blood pressure measured in the sitting, standing, and lying position to rule out orthostatic hypotension. Pupil dilation to permit evaluation of the fundus for hypertensive retinopathy is necessary.

Urinalysis should be performed with special attention paid to the presence of protein or red blood cells as an indicator of renal disease with secondary hypertension. EKG at rest should be evaluated for signs of ventricular hypertrophy.

GROUP I: NORMAL BLOOD PRESSURE READINGS

If there is no evidence of hypertension, no restrictions are necessary.

GROUP II: MILD HYPERTENSION (OVER 160 mmHg. SYSTOLIC OR 90-104 mmHg. DIASTOLIC) IS PRESENT OR BLOOD PRESSURE IS CONTROLLED (LESS THAN 90 mmHg. DIASTOLIC) ON MEDICATION OR DIET

An exercise EKG should be performed. If diastolic blood pressure remains below 100 mmHg. throughout testing, and systolic blood pressure remains below 200 mmHg., no activity restriction is necessary if exercise is completed through at least 12 METS of activity (Stage 4 Bruce protocol) and no evidence of ischemia or arrhythmia is found. However, candidates with diastolic blood pressure rising 10 mmHg. or more, or whose systolic blood pressure reaches 200 mmHg. or more with exercise are demonstrating a hypertensive response to stressful physical activity and should be restricted from engaging in job duties requiring this level of activity.

GROUP III: MODERATE HYPERTENSION (105-114 mmHg. DIASTOLIC) OR SEVERE HYPERTENSION (115 mmHg. DIASTOLIC AND ABOVE)

The risk of incapacitation and injury to the candidate or others is significant and medical treatment is required. The candidate should be restricted from performing activities which are physically demanding and/or have public health and safety implications.

Note: The World Health Organization and International Society of Hypertension recommend that diastolic blood pressures of 90 mmHg. or above should be repeated at least twice over the subsequent 4 week period of time. Those with results over 100 mmHg. should commence drug treatment. Those with values below 100 mmHg. should commence behavioral intervention and observation for 3 months. If after 3 months their values are still in excess of 95 mmHg., drug treatment should be considered; those below this level should continue with behavioral intervention and observation.

Given the above guidelines, it is possible that candidates may move from one of the above groups with treatment, or when treatment is altered or abandoned. The evaluation protocol should therefore begin after the candidate has shown stability for at least 3 months in Group I or II.

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DERMATOLOGY[1]

I. INTRODUCTION

A. CONDITIONS OF CONCERN

Skin disease may be due to a primary disorder or secondary to systemic diseases. For secondary disorders, evaluation of the underlying disease is required to ensure that it is not disqualifying in and of itself.

There are a variety of dermatological conditions that can have an impact on an individual's ability to perform patrol officer activities. Examples include:

- Eczema (hand, nummular) which in its severe stages can restrict the ability to handle weapons, apply physical restraints, etc. Severe eczema can also put an individual at significantly greater risk of substantial harm from exposure to toxic substances or bodily fluids;

- Psoriasis, if accompanied by marked fissuring or hyperkeratosis of the palms or soles, can have a significant impact on the ability to grasp and fully use one's hands or to perform duties that require weight bearing;

- Dermatitis (atopic -- e.g., wool, rubber allergies) can render an individual unable to wear rubber gloves or certain uniforms, or to handle various substances (e.g., fingerprint powder) common to patrol officer activities;

- Disorders due to heat, cold or vibration (sweat retention, Raynaud's disease, urticaria) and abnormal reactions to light (photodermatitis, polymorphic light reaction, solar urticaria) have obvious implications for an officer's ability to work outdoors or in other adverse environments;

- Cosmetic disfigurements (severe scarring, burns) can result in restricted functioning and otherwise interfere with an individual's flexibility, grip strength, etc;

- Systemic cutaneous lesions (autoimmune, infectious, drug reactions) may represent secondary disorders of other conditions that require evaluation.

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[1]Author: Stephen G. Weyers, M.D.
Specialist Review Panel: Robert Adams, M.D.; Timothy Berger, M.D.; Nikolajs Lapins, M.D.; Gerald Gellin, M.D.

General information on a variety of skin conditions can be found in Recent Advances in Dermatology (Phillips, et al., 1992).

B. IMPLICATIONS FOR JOB PERFORMANCE

While disorders of the skin severe enough to limit the ability to perform patrol officer job functions are quite rare, there are a number of job-related concerns that must be addressed when evaluating a candidate with skin abnormalities. These include:

1. Impact on Ability to Perform/Withstand Physical Job Demands. Both routine and vigorous physical activity may be hampered by severe skin conditions. Vigorous physical activity may be hampered by skin irritation or interference with treatment of the condition. Skin conditions may also result in restricted joint functioning in the hands or elsewhere. In addition, performance of job duties can be adversely affected by discomfort associated with severe skin conditions and distractions from pain or itching.

2. Risk of Infection/Contagion. Officers with open skin lesions or eczema can present a risk of body fluid exposure at accident and crime scenes.

3. Environmental Controls/Restrictions. Environmental conditions, such as high wind, dust, direct sunlight, snow and ice, and temperature extremes, present an extreme challenge to persons with certain cutaneous disorders. Other workplace conditions, such as the need to wear gloves when dealing with hazardous materials and to prevent exposure to bodily fluids, may interfere with the treatment of certain skin disorders or may otherwise worsen skin problems.

4. Heightened Proneness to Infection. Certain skin conditions (e.g., dermatitis), when coupled with the demands of the patrol officer position, can result in a very high risk of repeated and/or prolonged infection, which may require excessive time off for treatment or recuperation.

II. MEDICAL EXAMINATION AND EVALUATION GUIDELINES

A. GENERAL SCREENING RECOMMENDATIONS

1) History: The physician should obtain information regarding sensitivity to light, heat, cold, chemicals, vibration and food. Any history of skin conditions in the past should be reviewed, including the treatment required and the outcome of treatment.

2) Examination: The physical examination may reveal skin changes requiring additional history to clarify the significance of the condition. The skin should be examined for lesions to determine their type, distribution, shape, and arrangement. Table II-1 provides descriptions of primary skin lesions.

3) Routine testing: No routine testing is generally required of candidates.

TABLE II-1
Description of Primary Skin Lesions

1 Macule:	A flat, colored lesion, <2 cm in diameter, not raised above the surface of the surrounding skin. A "freckle," or ephelid, is a prototype pigmented macule.
2 Patch:	A large (>2 cm), flat lesion with a color different from surrounding skin. This differs from a macule only in size.
3 Papule:	A small, solid lesion, <1 cm in diameter, that is raised above the surface of the surrounding skin and hence palpable (e.g., inflammatory lesion of acne or small wart).
4 Nodule:	A larger (1-5 cm), firm lesion raised above the surface of the surrounding skin. This differs from a papule only in size (e.g., dermal nevus).
5 Tumor:	Palpable masses of variable size and consistency (e.g., basal or squamous-cell carcinomas).
6 Plaque:	A large (>1 cm) flat-topped raised lesion; edges may either be distinct (e.g., in psoriasis) or gradually blend with surrounding skin (e.g., in eczematous dermatitis).
7 Vesicle:	A small, fluid-filled lesion <1 cm in diameter that is raised above the plane of surrounding skin. Fluid is often visible, and the lesions are often translucent [e.g., vesicles in allergic contact dermatitis caused by Rhus (poison oak)].
8 Pustule:	A vesicle filled with leukocytes. Note: The presence of pustules does not necessarily signify the existence of an infection.
9 Bulla:	A fluid-filled, raised, often translucent lesion >1 cm in diameter.
10 Cyst:	A soft, raised, encapsulated lesion filled with semisolid or liquid contents.
11 Wheal:	A raised, erythematous papule or plaque, usually representing short-lived dermal edema.
12 Telangiectasis:	Dilated, superficial blood vessels.

Adapted with permission from Wilson, G.D., et al. (eds.). 1991. Principles of Internal Medicine, 12th ed. New York: McGraw-Hill.

B. EVALUATION OF COMMON CLINICAL SYNDROMES

1) Undiagnosed Skin Disorders: Should be evaluated and treated prior to determination of fitness for duty. Chronic or recurrent skin conditions should be evaluated by a dermatologist.

2) Minor Skin Conditions: Minor skin conditions can usually be treated successfully such that performance of patrol officer duties will not be adversely affected. Candidates with treated skin conditions that will not be worsened by the environmental conditions of the job or by performing essential job duties are medically qualified.

3) Treated Skin Conditions that Require Control of the Environment and/or Job Duties: If it is determined that the conditions and/or demands of the job will result in a relapse or worsening of the skin condition to a point where the candidate could not perform the essential functions of the job, or would pose a direct threat of harm to self or others, the individual is unsuitable for patrol officer work. However, this determination should not be made before considering possible work restrictions, controls, or other methods by which the individual could be accommodated to enable him/her to perform the job without a direct threat of harm.

4) Skin Conditions that Cannot be Effectively Treated to Maintain an Intact Barrier to Infection or Injury: Environmental conditions and exposure to emergency situations (e.g., administering first aid, subduing combative subjects) may present a direct threat of harm to the individual due to the risk of infection. Candidates with these types of skin conditions who are unable to work effectively and safely in emergency situations (even with reasonable accommodation) are unsuitable for patrol officer work.

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ENDOCRINE SYSTEM[1]

I. INTRODUCTION

A. OUTLINE OF HIGHLIGHTED CONDITIONS

1) Diabetes Mellitus

2) Parathyroid Disorders

3) Thyroid Disorders

4) Adrenal Disorders

B. IMPLICATIONS FOR JOB PERFORMANCE

The patrol officer position includes a variety of physically and emotionally demanding duties that require proper endocrine function, such as:

- Engagement in critical incidents involving exertion at maximum capacities for short periods of time (i.e., less than 15 minutes)
- Completion of academy training which may require prolonged exercise (i.e., greater than 30 minutes)
- Interruption of meals
- Prolonged driving with responsibility for the safety of a partner or arrestee
- High-speed pursuit driving
- Surveillance requiring sustained attention for hours at a time
- Split-second decision making regarding use of lethal force
- Rapid analysis of complex visual stimuli to differentiate weapons from other objects
- Control of one's emotions under stress

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[1] Author: R. Leonard Goldberg, M.D. with assistance from Catherine A. Goldberg, M.P.H., C.D.E. Diabetes Specialist Review Panel: David Bischoff, M.P.H.; William Clarke, M.D.; Sheri Colberg, Ph.D.; Philip Cryer, Ph.D.; Lois Jovanovic, M.D.; Dennis Pocekay, M.D.; Harry Shamoon, M.D.; Stephen Weyers, M.D.

II. MEDICAL EXAMINATION AND EVALUATION GUIDELINES

A. GENERAL SCREENING RECOMMENDATIONS

1) History: See Medical History Statement.

2) Examination: The routine physical exam should include measurement of the pulse at rest, and palpation of the thyroid.

3) Routine Tests: Urinalysis, which includes glucose and protein, should be performed.

B. EVALUATION OF COMMON CLINICAL SYNDROMES

1) DIABETES MELLITUS

a. GENERAL CONSIDERATIONS:

Diabetes is generally divided into two types. Type 1 is characterized by *insulin deficiency*, and requires treatment with insulin. Type 2 is characterized by *insulin resistance* which creates a relative insulin deficiency. It may be treated with diet modification, exercise, oral agents, and/or insulin. After a number of years, persons with type 2 diabetes are likely to develop insulin deficiency and require treatment with insulin.

Diabetes has implications for the safe and effective performance of peace officer duties because of both chronic and acute complications involving several major organ systems.

1. Job-Relevant Chronic Complications

Visual: Diabetic retinopathy may progress through three non-proliferative stages (mild, moderate, and severe) before proliferative retinopathy finally develops. In a survey from 1990, various stages of retinopathy were observed in 57% of patients (n=44) under the age of 30 with diabetes for less than ten years, with 2% having evidence of proliferative changes (Orchard, et al., 1990). Diabetic retinopathy can threaten central visual acuity. Additionally, at the severe non-proliferative and proliferative stages, activities that dramatically increase blood pressure (such as heavy lifting or wrestling) or cause active jarring (such as blows to the head, or jumping off walls) may precipitate vitreous hemorrhage or traction retinal detachment (A.D.A., 2004a). The risks of these complications can be substantially reduced by laser photocoagulation. However, this treatment can

cause significant loss of visual field in a substantial percentage of patients. Studies from England indicate that 12-19% of post laser patients were not able to meet the vision standards for driving in that country which include testing of peripheral vision (Pearson, et al., 1998; Mackie, et al., 1995).

Diabetic retinopathy can also cause a predominantly blue-yellow color vision deficiency (Utku & Atmaca, 1992; Lakowski, et al., 1972), and impairment of contrast sensitivity (Banford, et al., 1994; Brinchmann-Hansen, et al., 1993). Several studies indicate that impairment of color vision and contrast sensitivity may occur before the retinopathy is clinically visible (Kurtenbach, et al., 1994; Hardy, et al., 1992).

Neurological: Diabetes can cause both peripheral and autonomic neuropathy. Peripheral neuropathy may result in loss of protective sensation in the feet, and warrants limiting weight-bearing exercise such as prolonged walking and jogging to prevent ulcerations and fractures (A.D.A., 2004a). Autonomic neuropathy can affect cardiac function resulting in postural hypotension and hypotension following vigorous exercise. It may also result in abnormal thermoregulation which could create problems during exercise in hot or cold environments (A.D.A., 2004a).

Renal: Diabetes is the most common cause of renal failure. The earliest clinical evidence of diabetic nephropathy is the appearance of low, but abnormal levels of albuminuria, referred to as microalbuminuria (A.D.A., 2004b). While kidney function may not be affected initially, a high incidence of coronary heart disease has been shown to develop within the first few years after the onset of microalbuminuria in type 1 diabetic subjects (Jensen, et al., 1987).

Cardiac: Diabetes is well recognized as a major risk factor for coronary disease and silent ischemia. Additionally, it may cause impaired aerobic work capacity (Benbassat, et al., 2001; Wanke, et al., 1992), especially in patients who are not well-controlled (Niranjan, et al., 1997; Barkai, et al., 1996) or have complications such as autonomic dysfunction (Barkai, et al., 1996), neuropathy (Veves, et al., 1997), or microalbuminuria (Jensen, et al., 1988; Kebaek, et al., 1991). The magnitude of the aerobic impairment may be of relevance to the performance of peace officer duties. The study by Jensen, et al. (1988) found that the VO2max in young (mean age = 30) type 1 diabetic subjects with only microalbuminuria (30-300 mg/24 hr) was 28 ml O2/kg/min compared to 42 ml O2/kg/min (12 METS) in non-diabetic subjects.

It is important to note that the prevalence rates of these chronic complications are determined by the duration of the disease (Orchard, et al., 1990), and the level of glycemic control. In the Diabetes Control and Complications Trial (DCCT 1993) and the UK Prospective Diabetes Study Group (1998) trials, treatment regimens that reduced average A1C levels to approximately 7% were associated with significantly fewer microvascular complications. Epidemiological studies also

support the potential of good diabetic control to reduce the incidence of cardiovascular disease (Lawson, et al., 1999; Stratton, et al., 2000).

2. Job-Relevant Acute Complications

Hypoglycemia: Hypoglycemia can occur due to a relative excess of insulin or oral hypoglycemic medications. If not treated by ingestion of glucose, hypoglycemia will impair the performance of peace officer duties due to the rapid development of cognitive impairment. Functions that are most affected by hypoglycemia include rapid decision-making, sustained attention, analysis of complex visual stimuli, "mental flexibility," memory of recently learned information, and hand-eye coordination (Deary, 1999). Hypoglycemia can also cause increased irritability and anger (Deary, 1999). As hypoglycemia progresses to what is commonly called "severe" levels, frank confusion ensues which prevents self-treatment. If assistance is not forthcoming, the development of seizures, coma, and death may ensue.

The blood glucose level at which cognitive impairment begins varies considerably among individuals. However, several research studies have demonstrated significant neuropsychological and driving simulation impairments in 12-19% of subjects at blood levels as high as 65 mg/dl (Cox, et al., 2000; Gonder-Frederick, et al., 1994). Other studies have documented statistically significant decrements in cognitive function tests among groups of subjects at 60 mg/dl (Gschwend, et al., 1995) and 55 mg/dl (Fanelli, et al., 1998).

The major job-related factor that increases the risk of hypoglycemia for peace officers is the disruption of meals (DCCT, 1991). This is especially true for officers whose treatment regimen involves injecting regular insulin 30-45 minutes prior to meals, or those who use an intermediate acting insulin (such as NPH) that is expected to peak postprandially.

Additionally, when hypoglycemia develops in a peace officer, the demands of the job may distract or prevent the officer from responding appropriately to warning symptoms. For example, this could easily occur while responding to a call which requires in high speed pursuit driving, searching a building for an armed suspect, or when involved in confrontational situations.

Unanticipated exercise may also be a risk factor for hypoglycemia. However, this depends on the duration and intensity of the exercise. Exercise at moderate levels for more than 30 minutes will lower blood sugars. However, intense exercise of short duration (<15 minutes) has the opposite effect, resulting in sustained elevation of blood sugar for up to two hours (Sigal, et al., 1994; Mitchell, et al., 1988; Kjaer, et al.,1990). Since the vast majority of peace officer critical events involve intense exertion for a short period of time (< 10 minutes), hypoglycemia would not be expected to occur.

Hyperglycemia: Acute hyperglycemia is of potential concern because it may be a harbinger of diabetic ketoacidosis (DKA), or may produce cognitive impairment, fatigue, increased urination, and blurred vision.

DKA can develop in an individual with type 1 diabetes who has been insulin-deficient for a number of hours. This can potentially be precipitated by exercise. For this reason, the American Diabetic Association (A.D.A.) recommends that someone with type 1 diabetes use caution if exercising with blood glucose levels >300 mg/dl (A.D.A., 2004a). However, it seems highly unlikely that the short bursts of activity (i.e., <15 minutes) associated with critical events would be a major factor in causing ketoacidosis to occur in an officer.

Cognitive Impairment: The hyperglycemic level at which cognitive impairment is likely to develop is not clear. One study found that the time to complete subtractions significantly slowed above 270 mg/dl (Cox, et al., 2002). However, most studies have found no significant impairment during neuro-cognitive testing in the 300-380 mg/dl range (Draelos, et al., 1995; Hoffman, et al., 1989; Gschwend, et al., 1995; Holmes, et al., 1986). At higher glycemic levels (approximately 470 mg/dl), one study found that children score about 10% worse on I.Q. tests (Davis, et al., 1996).

Fatigue: Patients often report fatigue when their diabetes is chronically in poor control. However, there are very few studies documenting the hyperglycemic level at which this is expected to occur. Weinger, et al., (1995) found no significant increase in the mean intensity of fatigue complaints at blood sugars of 380 mg/dl in 42 type I diabetic subjects during an insulin-clamp study. Twenty-nine percent of her subjects did complain of feeling tired or weak, but an equal percentage reported feeling more energetic.

Increased Urination: Weinger, et al., (1995) found that urination was significantly increased at 380 mg/dl, affecting 39% of her subjects. More frequent or urgent urination could interfere with maintaining effective patrol duty or surveillance activities.

Blurred Vision is a common presenting symptom of diabetes. Myopic shifting with hyperglycemia was first reported in 1925 (Duke-Elder, 1925). The inverse phenomenon - hyperopic shifting - has been repeatedly observed with the initial treatment of uncontrolled diabetes (Okamoto, et al., 2000; Saito, et al., 1993), and has led to the general recommendation that persons with new onset diabetes wait until their sugars have stabilized before obtaining new glasses.

Several studies indicate that the magnitude of the myopic shifting expected with acute hyperglycemia could cause a candidate with poorly controlled diabetes to intermittently not meet an agency's vision guidelines. Gwinup, et al., (1976) administered a 25-gram dose of glucose intravenously to a group of six type 2 diabetic subjects who initially had a blood glucose of <150 mg/dl. Myopic shifting was observed within 15 minutes and peaked at approximately -0.75 D at 45 minutes after the glucose infusion. While the authors did not repeat measurements of blood sugars after the infusion, they noted that a rise in blood sugar of 150 mg/dl would be expected based on prior work by Amatuzio et al. (1953). Therefore, they estimated the rate of myopic change to be -0.5 D per 100 mg/dl increase in blood sugar. A second study measured refractions and glycemic levels in seven non-diabetic subjects who were given an oral glucose load with suppression of their insulin secretion by somatostatin (Furushima, et al., 1999). As average glucose levels rose from 70 to 279 mg/dl, the average change in refraction was -1.93 D, or approximately -0.9 D per 100 mg/dl. Unfortunately, neither of these studies conducted repeated direct measurements of the subjects' uncorrected visual acuity as glycemic levels rose. However, the myopic shifting observed would be expected to cause visual acuity to fall into the 20/50-20/70 range at glycemic levels of 300 mg/dl (see Table XI-13 in the Vision Guidelines Chapter).

The one study that conducted repeated direct measurements of visual acuity found that acuity remained stable when hyperglycemia was experimentally induced to an average level of 274 mg/dl in twenty diabetic subjects (Mangouritsas, et al., 1995). However, this study found that contrast sensitivity was significantly reduced during the hyperglycemic state.

These vision studies would seem to support an upper glycemic limit of 300 mg/dl in order to ensure adequate visual acuity. However, the studies' small sample sizes, use of non-diabetic subjects, and/or the use of indirect estimates of acuities and glycemic levels severely limits their reliability for quantitative purposes. Of note is that only 5% of subjects in the study by Weinger (1995) complained of blurry vision at 380 mg/dl.

In summary, it appears reasonable to require peace officers to maintain glycemic levels below 400 mg/dl while on duty. Until further research is completed, this level balances evidence-based concerns for job-related impairment against uncertainties regarding impairment at lower levels. It is interesting to note that the U.S. Federal Motor Carrier Safety Administration (2003) requires that truck drivers who use insulin to stop driving if their blood sugar exceeds 400 mg/dl.

3. Basis for Individualized Risk Assessments

Chronic Complications: An individualized assessment is necessary to determine the presence and significance of chronic complications. However, this will require more extensive testing than is routinely conducted on non-diabetic candidates (see Recommended Evaluation Protocol below).

Acute Complications:

Hypoglycemia - For a given individual, the risk of impairment on duty depends on two factors: the individual's glycemic threshold for impairment, and the likelihood of dropping below this threshold while on duty.

As discussed above, the threshold for neuro-cognitive impairment has been measured to be as high as 65 mg/dl in 12-19% of diabetic subjects. Ideally, it would be advantageous to directly measure the impairment threshold in each candidate. However, outside of research settings, it is currently not possible to individually assess impairment thresholds. Given the critical need for patrol officers to be neuro-cognitively intact at all times, one must assume that a diabetic officer would be significantly impaired in the performance of their duties at glycemic levels of 65 mg/dl or lower.

Notwithstanding the job-related factors that can increase the risk of hypoglycemia, the likelihood that a diabetic peace officer will experience glycemic levels of 65 mg/dl or lower on the job depends primarily on the medication used.

Use of Insulin: The risk of having glycemic levels of $\leq$65 mg/dl is highest for officers who use insulin. A great deal of research has attempted to identify individual risk factors for hypoglycemia among insulin-users. This research indicates that patients who either have hypoglycemia unawareness, or who have had a recent occurrence of severe hypoglycemia (an episode requiring assistance from another person) are at exceptionally high risk. For example, MacLeod, et al. (1993), found that 91% of patients with hypoglycemia unawareness had experienced an episode of severe hypoglycemia (SH) in the preceding year. In the DCCT study (1997), an episode of SH was shown to result in an elevated risk for a second event for the next three years (see Table III-1).

Even in the absence of these two major risk factors, the incidence rate of hypoglycemia is high enough to be of concern for police work. For example, two studies in the early 1990s found that 18-26% of patients with normal hypoglycemic awareness had an episode of SH in the preceding year (MacLeod, et al., 1993; Gold, et al., 1994). In the DCCT study, subjects whose last episode of SH was three years prior, still had annual rates of SH of approximately 8% (Table III-1).

Table III-1: Annual Risk of a Recurrent Major Hypoglycemic Event After an Initial Occurrence				
	Conventional Therapy		Intensive Therapy	
Time after initial event (yrs)	Severe Hypoglycemia	Seizure/ Coma	Severe Hypoglycemia	Seizure/ Coma
0	42%	27%	52%	32%
1	17%	10%	31%	19%
2	15%	5%	27%	7%
3	7%	3%	8%	12%
4	8%	5%	9%	16%

Data derived from DCCT Research Group, 1997. Hypoglycemia in the Diabetes Control and Complications Trial. Diabetes (46):271-286.

Secondary risk factors for hypoglycemia include a low hemoglobin A1C (A1C), use of intensive insulin therapy (i.e., ≥three injections per day or use of an insulin pump), and autonomic dysfunction. However, formulas which considered these factors as well as the recency of SH and hypoglycemia unawareness have been shown to predict, at most, only 18% of future severe hypoglycemic episodes (Gold, et al., 1997). Their predictive value for the occurrence of glycemic levels of ≤65 mg/dl would be considerably less.

A research group at the University of Virginia has taken a different approach to the prediction of hypoglycemia. Over the last ten years, they have developed software that can be used to analyze routinely collected blood glucose (BG) meter data. Based on 4-6 weeks of data, the software generates a Low Blood Glucose Index (LBGI), which has been shown to independently predict 55% of the episodes of SH over the ensuing several months (Kovatchev, et al., 2003; Kovatchev, et al., 1998). Adding recent SH episodes and A1C levels to the statistical model only predicted an additional 7% of future SH episodes. The index has also been shown to be very effective in predicting the incidence of blood sugars in the range of 39-55 mg/dl. Table III-2 shows that the LBGI can be used to categorize patients into likelihood groups for recurrent blood sugars in this range. However, even in the lowest risk group (LBGI <1.1), type 1 diabetic subjects were still observed to have blood sugars =/<55 mg/dl an average of 1 ½ times per month.

Table III-2: Number of Prospectively Observed Hypoglycemic Episodes (39-55 mg%) Per Person Per Month by Risk Category and Type of Diabetes				
Diabetes Type	LBGI Value			
	<1.1	1.1-2.5	2.6-5.0	>5.0
T1 DM (n=48)	1.47	2.56	6.20	11.50
T2 DM (n=48)*	0.38	0.65	5.91	11.00

**Treated with insulin*

From Kovatchev BP, et al., 2002. Algorithmic evaluation of metabolic control and risk of severe hypoglycemia in type 1 and type 2 diabetes using self-monitoring blood glucose data. Diabetes Technology & Therapeutics 5(5):817-28.

While studies indicate that type 2 diabetic subjects on insulin therapy are at lower risk for SH than type 1 diabetic subjects, their risk of having glycemic levels of ≤65 mg/dl remains high. Annual rates of symptomatic SH appear to range from 2-12% per year (Leese, et al., 2003; UKPDS,1998; Hepburn, 1993; Abraira, et al., 1995). Schwartz, et al (1998) followed a group of 118 type 2 diabetic subjects (mean age 56 years) for six months. During this time period, 8% had BG meter values ≤50mg/dl despite an average A1C of more than 9%. Recently, a peakless insulin, glargine (trade name Lantus), has been advocated for use by persons with type 2 diabetes. While this does reduce the risk of hypoglycemia compared to NPH, Rosenstock, et al. (2001) observed that 7% of patients using glargine had episodes of blood glucose <36 mg/dl over a 28-week observation period. As with type 1 diabetes, the best individualized predictor of future hypoglycemic episodes is the LBGI. However, even in the lowest risk group (LBGI <1.1), type 2 subjects using insulin were still observed to have blood sugars =/<55 mg/dl an average of 0.4 times per month or almost five times per year (Table III-2).

In conclusion, research has indicated that the use of insulin by a peace officer creates a significant risk[2] of hypoglycemia on the job regardless of individual risk factors, state-of-the-art risk assessment tools, or diabetes type.

Use of Oral Medications: There are presently six classes of oral medications available for the treatment of type 2 diabetes. Hypoglycemia is of concern primarily for three of these classes- sulfonylureas, meglitinides (trade name Prandin), and d-phenylalanine derivatives (trade name Starlix).

For the second generation sulfonylureas that are in common use (glyburide, glipizide, and glimepiride), the reported incidence rates of hypoglycemia are highest with glyburide (Holstein & Egberts, 2003). For this drug, the incidence of SH has been reported to be 0.6-1.6% per year (Sugarman, 1991; Holstein, et al., 2001; UKPDS,1998). This compares to a rate of 0.09% for glimepiride (Holstein, et al., 2001). The hypoglycemic rates for glipizide have been reported to be similar to glimepiride (Clark & Goldberg, 1997).

While the occurrence of SH with sulfonylureas does not appear be a major concern, the same cannot be said for the occurrence of glycemic levels of ≤65 mg/dl. Studies indicate that patients who take sulfonylureas frequently complain of hypoglycemia. The UK Prospective Diabetes Study Group (1998) found that symptomatic self-treated hypoglycemia occurred in 16-

[2] As discussed in "Pre-Employment Screening and the Law," an absolute risk of >1% per year is used in this manual as an informal rule-of-thumb guideline for determining risk to others

21% of patients annually. Jennings, et al. (1989) found that 20% of patients (age 40-65) reported hypoglycemic symptoms over a 6-month period. Among subjects in a series of five one-year clinical trials, 20% of those using glyburide and 19% of those using glipizide reported mild or moderate hypoglycemia (Novo Nordisk, 2004).

In these studies, subjects did not measure their glycemic levels at the time of their symptoms. Therefore, their perception of hypoglycemia may not always indicate a glycemic level ≤65 mg/dl, especially in patients with poorly controlled diabetes. However, it is likely that a substantial portion of the symptomatic episodes did occur at ≤65 mg/dl. Korzon-Burakowska, et al. (1998) observed that the average plasma glucose threshold at which hypoglycemic symptoms first developed in a group of seven poorly controlled type 2 diabetic subjects (average A1C=11.3) was 65 mg/dl. After improvement in their control to an average A1C level of 8.1, their threshold dropped to 54 mg/dl.

Most studies indicate that age >60 and taking drugs that potentiate the effects of sulfonylureas are risk factors for hypoglycemia. Nevertheless, the absence of these risk factors in the typical police candidate does not warrant that the hypoglycemic risks associated with sulfonylureas be ignored. Regarding age, the average age of the participants in the UK Prospective Diabetes Study Group (1998) study was only 54 years. Furthermore, Leese, et al. (2003), found no difference in age between type 2 diabetic subjects who had SH vs. those who did not. Regarding potentiating medications, Jennings, et al. (1989) reported that 75% percent of patients reporting hypoglycemic symptoms with sulfonylureas were not taking potentiating drugs.

Finally, the risk of hypoglycemia with sulfonylureas increases if a meal is missed or food intake is reduced (Stahl & Berger, 1999; Seltzer, 1989). Damsbo, et al. (1999) measured afternoon glycemic levels in 41 patients (average age 58 years) who skipped lunch. Four complained of hypoglycemic symptoms, and two were asymptomatic but had measured blood sugar levels <45 mg/dl. Burge, et al. (1998) did not observe any glycemic levels <50 mg/dl after subjects were fasting for 23 hours. However, these patients started the fasting period with a mean glycemic level of about 170 mg/dl. For the lower quartile who started the fast at a glycemic level of 104 mg/dl, the average dropped to 71 mg/dl. Therefore, it is very likely that some of these patients experienced hypoglycemic levels of concern for peace officers (i.e. <66 mg/dl) during the fast.

Prandin is a newer medication that is designed to treat postprandial hyperglycemia. It has a duration of action of only 2-3 hours and is taken just prior to meals. It offers an advantage over sulfonylureas in that meals can be missed or delayed with a lower risk of hypoglycemia (Damsbo, et al., 1999; Mafauzy 2002). Perhaps for this reason, the incidence of SH with

Prandin has been reported to be approximately half of that with sulphonylureas (Schatz, 1999; Kristensen, et al., 2000). However, in one-year comparative trials, the overall incidence of hypoglycemia in patients who use Prandin was observed to be fairly equivalent to those who use sulfonylureas (Schatz, 1999; Novo Nordisk 2004).

While structurally different from Prandin, Starlix is also a short-acting hypoglycemic designed to be taken with meals. However, its hypoglycemic effect has a more rapid onset and shorter duration than Prandin. Consequently, Starlix is also associated with less hypoglycemia than the sulfonylureas. However, the incidence of hypoglycemia is still high enough to be of concern for an officer. In an 8-week clinical trial, Hollander, et al. (2001) found that 12% of subjects complained of hypoglycemic symptoms. Hypoglycemia was confirmed by self-monitoring of blood glucose in 3% of the subjects (levels not given). Saloranta, et al. (2002), found that 5% of patients using Starlix experienced symptomatic hypoglycemia with documented blood sugars < 60 mg/dl during a 24-week study.

For various reasons, the incidence of hypoglycemia is very low if any of the following classes of medications are used as mono therapy: biguanides (Glucophage), alpha-glucosidase inhibitors (Precose, Glyset), or thiazolidinediones (Actos, Avandia) [Holstein & Egberts, 2003].

Hyperglycemia - As discussed above, glycemic levels >400 mg/dl are of concern for a peace officer. All persons with diabetes are at risk of having high sugars, especially after meals. However, the frequency at which this will occur depends on the overall level of disease control. In a study of type 2 diabetic subjects who were either diet-controlled (n=84) or taking oral agents (n=134), Erlinger & Brancati (2001) observed that average postprandial glucose levels rose dramatically if A1C levels were >7%. At A1C level of <7%, the mean two-hour postprandial glucose level was 185 mg/dl. However, at A1C levels of 7-7.9%, the mean rose to 325 mg/dl; at A1C levels of 8% or higher, the mean was 402 mg/dl.

In summary, the only candidates who are not at significant risk of experiencing either significant hypo- or hyperglycemia as peace officers are those who have type 2 diabetes controlled by either diet, a biguanide (Glucophage), alpha-glucosidase inhibitor (Precose, Glyset), or a thiazolidinedione (Actos, Avandia), and who also have an A1C <7%. For other candidates, requiring methods to reduce the risk of impairment on duty can be justified to ensure the safe and effective performance of essential duties.

4. Methods of Reducing Risks

There are several methods that potentially can reduce the risk of hypo- and hyperglycemia occurring while on-duty or mitigate the resulting impairment. The purpose of the following analysis is to determine which are reasonable and effective.

Carrying Glucose Tablets*:* Hypoglycemia can be self-treated by ingestion of 10-30 grams of carbohydrate. Glucose tablets which contain 4-5 grams each can be easily carried by an officer. However, carrying these tablets will not sufficiently reduce the risk of impairment on duty. Using a driving simulator, Cox, et al.(2000), has shown that diabetic subjects who are provided with a food source will not reliably consume food to prevent their blood sugars from dropping below 66 mg/dl. The mean blood glucose level at which subjects either treated themselves or stopped driving was 49 mg/dl, and 43% of the severely impaired subjects took no corrective action. Failure to use an available glucose source was not solely due to hypoglycemia unawareness. When blood glucose levels were in the 50-59 mg/dl range, 33% of the subjects detected their hypoglycemia and 22% detected their driving impairment, yet only 3% took corrective action.

Self-Monitoring of Blood Glucose (SMBG): Frequent SMBG can lead to detection and correction of dangerously low or high blood sugars, and, in theory, should reduce the risk of hypoglycemia on the job. However, for this to be the case, the following considerations regarding SMBG must be addressed:

Frequency of Testing - Despite testing at commonly recommended frequencies (3-4 times per day), persons with type 1 diabetes can still experience SH at high frequencies. In the DCCT (1997) study, the intensively treated group was instructed to perform SMBG four times a day, and to awaken at 3 a.m. to do SMBG at least once a week. Despite this monitoring, SH still occurred at a rate of 0.6 episodes/patient per year. Cox, et al. (1999) found no difference in the frequency of SMBG/day between a group of patients who reported at least two episodes of SH in the past year vs. a group with no SH in the past year (3.5 tests/day vs. 3.8 tests/day). Therefore, testing 3-4 times a day or every 4-5 hours will not prevent hypoglycemia from occurring. Additionally, traditional recommendations for testing before meals will not detect postprandial hyperglycemia.

Consequently, to effectively prevent on-the-job impairment for officers using insulin, testing will have to be more frequent than every four hours. A pre-shift test followed by testing every 2 hours would be ideal. With this set as a goal, the occasional short delays in testing caused by situations beyond the control of the officer should not pose a major risk.

For officers using sulfonylureas, a lower risk of hypoglycemia warrants less frequent testing. A pre-shift test is needed to determine the officer's fitness

to begin the shift. Testing every four hours thereafter should significantly lower the risk of impairment on the job. Testing at two hours after meals to detect hyperglycemia is also indicated if A1C levels are ≥ 7.0%. For example, if a 10-hour shift starts at 7 a.m. and ends at 5 p.m. with a meal at noon, testing should be done at 7 a.m., 11 a.m., and 2 p.m. (two hours after the meal started). For a 12-hour shift ending at 7 p.m., an additional test should be done at 6 p.m.

For officers on Prandin or Starlix, the risk of hypoglycemia would be expected to be greatest in the postprandial period as glycemic levels drop, but drug action is still present. These officers should be required to conduct a pre-shift test and a test at two hours after meals.

For officers on non-hypoglycemic medication or diet, detection of hyperglycemia would warrant a pre-shift test followed by testing at two hours after each meal unless A1C levels are < 7.0%.

Performance Characteristics of the BG Meter - There are a large number of BG meters on the market. To ensure the integrity of the information that is reviewed by the health professional, the BG meter must meet the following requirements:

- Be downloadable to software in the health professional's office,
- Not allow the patient to change recorded values, dates, or times, and
- Automatically recognize and record when control solutions are placed on the testing strip.

At the time of this writing, there are only two meters that can meet these requirements: the OneTouch Profile by Johnson & Johnson, and the Contour by Ascensia (Bayer). The Contour meter is preferable in that it reports results more quickly, requires less blood, and is smaller in size than the OneTouch. Furthermore, the OneTouch is no longer actively marketed.

To date, two devices capable of continuous glucose monitoring have received FDA approval: the Glucowatch by Cygnus and the Guardian by Medtronic MiniMed. The GlucoWatch is worn like a watch and measures glucose non-invasively from interstitial fluid. However, there are several limitations with this device that would greatly limit its effectiveness for officers. First, it is very sensitive to perspiration, temperature changes (i.e., going from air conditioning to a hot car) and jarring. These factors can cause it to miss readings and to unexpectedly shut off. To restart the meter after a shut-off, one must apply a new sensor pad and wait through the two-hour warm-up period. Colberg (2003) found that slightly more than a third of subjects who were just resting outdoors for 45 minutes in temperatures from 75-91 degrees with humidity from 30-100% got no readings at all. Indoor resting was only slightly better with 29% of subjects obtaining no readings. The device shut off 37-50% of the time following

outdoor activity. The second major limitation of the Glucowatch is its very poor sensitivity for detecting low blood glucose. Research from the Jaeb Center for Health Research (DirecNet Study Group, 2004) indicates that in order to detect 92% of the occurrences of a glucose of ≤60 mg/dl, the alarm would have to be set at 120 mg/dl. This would result in a false alarm rate of 85%.

The second continuous glucose monitoring device, the Guardian, uses a subcutaneous sensor consisting of a glucose oxidase-plated platinum electrode that is inserted subcutaneously on the abdomen or another location by the patient and is worn for three days. During that time, the sensor measures glucose in the subcutaneous fluid every 10 seconds and stores the average of 30 measures obtained over five minutes. Calibration of the device requires that SMBG be done by the patient at the time of application and four times a day thereafter. While the data collected must be downloaded to a computer before it can be viewed, the Guardian features an alarm system that can be set for both high and low values. However, there are several potential concerns regarding its use by peace officers. The first is the potential disruption of the wireless (RF) link from the sensor to the recording device by placement of the sensor under a bulletproof vest, although it is unknown whether this would occur. Second, as with the GlucoWatch, sensitivity for detecting low sugars is a problem. In order to detect 100% of the occurrences of a glucose of ≤60 mg/dl, the alarm would need to be set at 100 mg/dl. This would result in a false alarm rate of 75%(DirecNet Study Group, 2004). Between doing SMBG for calibrations and repeating SMBG for false alarms, the user would probably end up doing SMBG as often as required in the protocols above.

Cut Points for Intervention - As discussed above, impairment from hypoglycemia may begin when blood sugars drop to approximately 65 mg/dl. However, as glycemic levels approach 65 mg/dl, action to raise glycemic levels is warranted to provide a margin of safety while performing safety-related tasks. Unfortunately, there are no studies available to assist in the selection of an appropriate threshold at which action should be taken. However, recent consensus guidelines regarding the initiation of driving have been published from three sources. The research group at the University of Virginia, which has conducted numerous driving simulation studies, recommends that the threshold for corrective action be 90 mg/dl for persons with type 1 diabetes (Cox, et al., 2003). Based on recommendations by a panel of endocrinologists, the U.S. Federal Motor Carrier Safety Administration (D.O.T., 2003) requires that truck drivers who are treated with insulin (type 1 and 2 diabetes) take corrective action at glycemic levels <100 mg/dl. Finally, Cooppan (2003) recommends in the Joslin's Diabetes Deskbook that carbohydrate be ingested prior to driving if glycemic levels are <125 mg/dl, especially in patients using intensive insulin regimens involving multiple injections or insulin pumps.

Cooppan's recommendations suggest that the hypoglycemic threshold for action should be different for different patients. There is a rational basis for this, as vulnerability to rapid declines in glycemic levels varies among individuals. In general, persons with type 1 diabetes demonstrate faster descent into hypoglycemia than those with type 2 on insulin (Kovatchev, et al., 2002). Type 2 diabetic subjects on oral hypoglycemics are likely to descend even more slowly. Therefore, it would be reasonable to require, in general, that persons with type 1 diabetes take corrective action when their glycemic levels are less than 100 mg/dl. However, if individual review of historical SMBG data indicates evidence of recurrent rapid glycemic descents, the evaluating physician could be justified in recommending an action threshold as high as 125 mg/dl. For persons with type 2 diabetes on insulin or oral medications, an action threshold of 90 mg/dl could be used unless individual review warrants a higher level.

Action levels for hyperglycemia should be set at 400 mg/dl based on the considerations described above.

Appropriate Interventions - To reduce the risk of impairment on the job, aggressive intervention is justified if blood sugars are found to be outside the safe ranges. If below the hypoglycemic intervention threshold but above 65 mg/dl, 15 grams of fast-acting carbohydrate should be consumed. Thirty minutes later, the blood sugar should be retested. If the glycemic level is still below threshold, another 15 grams should be ingested. If the glycemic level drops to 65 mg/dl or lower, the officer must be restricted from safety-related duties until levels increase to the hypoglycemic threshold and have been maintained for at least 30 minutes. This is necessary to allow delayed recovery of cognitive functioning (Gonder-Frederick et al., 1994; Lingren et al., 1996). If SH occurs either on or off-duty, the officer should be placed on restricted duty until the risk of recurrence can be assessed by the employer's medical staff. The risk criteria for returning such an officer to full duty should be the same as that used in pre-placement assessments.

For glycemic excursions above the hyperglycemic threshold, the officer should be restricted from safety-related duties until his/her blood sugar has dropped below the threshold. Testing every 30-60 minutes would be appropriate.

If the candidate is willing to comply with these requirements, then it is likely that SMBG would significantly reduce the risk of impairment on the job.

Basal-Bolus Regimens: Older insulin regimens typically involve taking two shots a day with each shot combining a short-acting insulin such as regular with an intermediate acting insulin such as NPH. The NPH in the morning dose is intended to provide coverage for the anticipated glycemic load consumed at lunch. However, if lunch is missed or disrupted (a not-unlikely event for officers),

there is a significant risk of hypoglycemia. This risk can be substantially reduced if a basal-bolus regimen is used. A basal-bolus regimen typically involves a peakless insulin given once a day (insulin glargine) or a continuous constant infusion of insulin (see "Insulin Pumps" below) supplemented by ultra-rapid insulin (insulin aspart or lispro) taken at each mealtime. Unlike regular insulin, which should be taken 30-45 minutes before a meal, insulin aspart and lispro can be effective when taken as the meal arrives or minutes after eating has commenced. Therefore, basal-bolus regimens greatly increase flexibility in the timing of meals, making it safer for an officer to delay a meal in the event of an emergency. For this reason, a basal-bolus regimen should be required for candidates who use insulin, unless the hiring agency places their officers off radio call during meals.

5. Miscellaneous Issues

Alternate site testing: The Contour meter is able to analyze blood obtained from sites other than the fingers. However, testing by the manufacturer indicates that the only alternate site that met the performance criteria established by the International Standards Organization was the hypothenar eminence of the palm (Baum, 2003). Additionally, it is generally well established that glucose values obtained from alternate sites may not reflect current values when glycemic levels are rapidly changing (A.D.A. 2003). At these times, the detection of hypoglycemia may be delayed for 15-20 minutes if alternate sites are used. For these reasons, alternate site testing should not be considered acceptable for monitoring officers.

Insulin Pens: Insulin pens eliminate the need for officers to carry syringes and vials. They are compact and facilitate precise dosing. While the cost is somewhat higher, use of pens for administration of insulin while on duty should be strongly encouraged.

Insulin Pumps: Insulin pumps consist of a pager-sized insulin storage and pumping device which is connected to a plastic cannula attached to a small needle. The needle is inserted subcutaneously, usually into the abdomen. The device provides a continuous basal infusion of insulin, which is supplemented by pre-meal boluses that are controlled by the patient. This allows for more physiologic dosing of insulin and more flexibility in the timing of meals. It is expected that the pump could be used successfully by officers. Dislodgement of the needle is possible due to trauma, but this would result in slowly rising glycemic levels that would be detectable by the frequent SMBG performed by officers who use insulin. Officers who choose to use a pump should be strongly encouraged to carry an insulin pen as a back-up in case their infusion cannot be easily reestablished.

Academy vs. Field Assignments: Despite rigid scheduling of activities, fair employment laws would require that an academy allow a diabetic recruit to perform SMBG, take insulin, and to consume rapidly absorbable carbohydrate as needed during training. Of note is that the U.S. Department of Justice recently

settled a complaint, in favor of the complainant, involving a training academy's failure to accommodate a diabetic police recruit who was discharged from a training academy for having hypoglycemia (DOJ, 2004). The academy had denied the recruit's repeated requests for access to additional food at more frequent intervals.

b. RECOMMENDED EVALUATION PROTOCOL:

The evaluation protocol includes three phases. The first phase assesses the need for work restrictions due to chronic complications or recent episodes of severe hypoglycemia, seizure, or coma. The second phase evaluates candidates' ability to maintain their glycemic levels in the range (66-399 mg/dl) that will not require frequent periods of restricted duty. This requires a prospective observation period of simulated on-duty testing. The third phase of the protocol requires the candidate to review and sign a customized pre-placement agreement which obligates them to perform SMBG while on duty, to take appropriate action for blood sugars that are out of range, and to provide the employer's designated health professional with access to relevant medical records after hire.

Phase I - Initial Screening.

History and Record Review:
The screening physician should obtain detailed information regarding the candidate's medication regimen, symptoms and complications of diabetes, use of SMBG, and prior episodes of hypoglycemia with particular emphasis on severe episodes in the previous three years that required assistance or resulted in seizure or coma. The physician should download the candidate's BG meter if possible, or manually scan the data. Blood sugars below 66 mg/dl or above 399 mg/dl should be discussed with the candidate.

Medical, laboratory, and pharmacy records from the last three years should be obtained from all health care providers. Examinations and testing for retinopathy and nephropathy (microalbuminuria) should be noted. If a retinal examination with dilated pupils has not been completed by an ophthalmologist in the past year, it should be requested for all candidates with type 2 diabetes and those with type 1 diabetes for three years or more.

Special Examination Recommendations:

Eyes: In addition to pseudoisochromatic plate testing, routine color vision testing for candidates with diabetes should include the Farnsworth D-15 or other test which specifically assesses the presence of blue-yellow color vision deficiency. A history of laser photocoagulation would warrant formal perimetry testing conducted by a vision specialist.

Neurological: Screening for peripheral neuropathy should include testing of the deep tendon reflexes, vibratory testing, testing of position sense, and touch sensation. The latter should be done with a Semmes-Weinstein 5.07 (10 gm) monofilament.

Cardiovascular: Orthostatic blood pressure should be measured (see Carlson 1999 for protocol and interpretative recommendations). Postural hypotension or resting tachycardia (heart rate >100, not otherwise explained) is indicative of autonomic neuropathy. The physical examination should include palpation of pedal pulses and observation of distal extremity hair to evaluate the presence of peripheral vascular disease. To detect silent ischemia, cardiac stress testing is recommended if any of the following criteria are present (A.D.A., 2004a):

- Age >35 years
- Age >25 years, and either type 2 diabetes >10 years, or type 1 diabetes > 15 years duration
- Any additional risk factor for coronary artery disease, such as smoking, obesity, hypertension, or elevated cholesterol
- Evidence of microvascular disease such as retinopathy or
- Peripheral vascular disease

Additionally, to detect significant diabetes-related aerobic impairment, candidates with autonomic neuropathy, peripheral neuropathy, microalbuminuria, or poor control (A1C >10%) should also be given a cardiac stress test and be required to complete at least 12 METs.

Routine Testing: A1C and urinary microalbumin should be tested if not previously performed within the last six months. Testing for microalbumin can be conducted with specialized dipsticks that are commercially available.

Based on record review and the above testing results, restrictions would be warranted if any of the following conditions are detected:

Untreated or unstable severe non-proliferative or proliferative retinopathy - These candidates should be restricted from heavy lifting, wrestling, or jarring activities, such as jumping off walls or exposure to head trauma. These restrictions could be reconsidered after successful laser photocoagulation, assuming that post-operative visual acuity and fields are still acceptable.

Color vision deficiency - Candidates who fail the Farnesworth D-15 should be restricted from duties requiring rapid and accurate color identification and high-speed emergency driving (see Chapter XI - Vision Guidelines).

Coronary disease - Unless adequate fitness (≥12 METS), without ischemic change or hypertensive response is demonstrated, candidates should be restricted from physical activities (see Chapter I - Cardiovascular System).

Exercise impairment - If <12 METs is obtained on treadmill testing, restrictions can be based on the measured maximum aerobic capacity of the candidate. However, candidates should be encouraged to increase the intensity of their physical training, and be offered retesting at a later time.

One or more episodes of severe hypoglycemia in the last three years - Table III-1 indicates that the risk of recurrence in the next year is 15-52% for these candidates, which far exceeds an acceptable risk level for on-duty incapacitation.[3] This is true even considering that approximately half of the episodes of severe hypoglycemia observed in the DCCT trial occurred while asleep (DCCT, 1991), and that only a third of a person's waking hours are spent at work. Therefore, restricting these candidates from safety-related duties is warranted.

Seizure or coma in last two years - Table III-1 indicates that the risk of recurrence in the next year is 10-32%. Even if this annual risk is reduced by factoring in nocturnal and off-duty episodes (thereby reducing the estimate by a factor of 6), the on-duty annual risk still remains above an acceptable level.

Loss of protective sensation in the feet - To prevent ulcerations and fractures, these candidates should be restricted from prolonged walking and jogging.

Postural hypotension - If this condition is symptomatic, these candidates would need to be restricted from field duty.

Use of a two-shot insulin regimen - To prevent hypoglycemia, these candidates would need to be restricted from assignments that could result in meal disruption.

If there are no findings that warrant restrictions, or if the restrictions indicated above can be accommodated by the agency, then the evaluation can proceed to Phase II. However, prior to doing so, the screening physician should explain to candidates with A1C >7.0% that they will be required to conduct more rigorous and frequent SMBG testing while on duty. They should be encouraged to see their health care provider to determine if their therapeutic regimens can be intensified in order to achieve an A1C level of <7.0%, as recommended by the American Diabetes Association (A.D.A., 2004b). Additionally, candidates using a two-shot insulin regimen should have the opportunity to change to a basal-bolus regimen if the hiring agency does not allow officers to go off radio-call during

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[3] As discussed in "Pre-Employment Screening and the Law," an absolute risk of >1% per year is used in this manual as an informal rule-of-thumb guideline for determining risk to others.

meals. If the therapeutic regimen is changed, the Phase II evaluation should be deferred until the candidate is stabilized on the new regimen.

Phase II - Simulated On-Duty Testing

With the exception of those candidates who meet the conditions specified under Group I, Level 1 (see below), all candidates will be required to perform SMBG while on duty, and to maintain their blood sugars in the range of 66-399 mg/dl. Since many candidates will find it difficult to achieve 100% compliance with this target range, and excursions will result in periods of restricted duty, the screening physician should advise the hiring agency regarding how often periods of restricted duty are likely to occur.

To make this assessment on an individualized basis, the screening physician should require the candidate to undergo a prospective observation period of at least three months duration that simulates on-duty SMBG testing requirements. To accomplish this, the candidate should be required to perform the following:

(1) Obtain a Contour BG meter. The screening physician should recommend that this meter be used exclusively for required testing under this protocol, and that other testing be done on the candidate's pre-existing BG meter. This ensures that the memory capacity of the required BG meter (250 values) will not be exceeded, and facilitates review of required testing by the physician.

(2) Select five days of the week that will be simulated on-duty days. (This assumes that the candidate will be working 8-hour shifts. Four days could be selected for 10-hour shifts; three days for 12-hour shifts.) The days selected cannot be changed by the candidate once the observation period begins without prior approval from the screening physician.

(3) Select the times that the "work shift" will start and end. This cannot be changed by the candidate once the observation period begins without prior approval from the screening physician.

(4) Select the time that "on-duty" meals will start (only for candidates who do not use insulin). This cannot be changed by the candidate once the observation period begins without prior approval from the screening physician.

(5) Select a start date for the observation period.

(6) Perform SMBG within +/- 5 minutes of the testing times specified by the screening physician. A short testing window is necessary to prevent candidates from "pre-testing" with an alternate BG meter and manipulating their glycemic level prior to testing with the designated BG meter. These testing times should be clearly communicated to the candidate before the

observation period commences. The recommended frequency of testing during the observation period is as follows:

GROUP I: CANDIDATES WHO DO NOT USE INSULIN :

Level 1: *Controlled with diet and/or a biguanide (Glucophage), alpha-glucosidase inhibitor (Precose, Glyset), or a thiazolidinedione (Actos, Avandia); and A1C <7.0%, and historical glycemic levels are >65 and <400 mg/dl*

No on-duty SMBG is necessary. Therefore, the candidate's evaluation may proceed to Phase III.

Level 2: *Controlled with diet and/or a biguanide (Glucophage), alpha-glucosidase inhibitor (Precose, Glyset), or a thiazolidinedione (Actos, Avandia); but A1C ≥7.0%, or historical glycemic levels are occasionally >400 mg/dl. Also includes all candidates who use a meglitinide (Prandin), or d-phenylalanine derivative (Starlix)*

The observation period should include testing at the shift start time and at 2 hours after "on-duty" meals.

Level 3: *Controlled with a sulfonylurea, and A1C <7.0%, and historical glycemic levels are <400 mg/dl*

The observation period should include testing at the shift start time and every four hours thereafter. No testing at the end of the shift is needed.

Level 4: *Controlled with a sulfonylurea, but A1C ≥7.0%, or historical glycemic levels are ≥400 mg/dl*

The observation period should include testing at the shift start time, followed by a test every four hours and at two hours after "on-duty" meals. For example, if a 10-hour shift starts at 7 a.m. and ends at 5 p .m. with a meal at noon, testing would be conducted at 7 a.m., 11 a.m., and 2 p.m. (two hours after the meal started). For a 12-hour shift ending at 7 p.m., an additional test would be done at 6 p.m. No testing at the end of the shift is needed.

GROUP II: CANDIDATES WHO USE INSULIN: The observation period should include testing at the shift start time, and then every 2 hours. No testing at the end of the shift is needed.

(7) Repeat SMBG within 30 minutes whenever a reading is <100 mg/dl in candidates with type 1 diabetes, or <90 mg/dl for those with type 2 diabetes. To avoid dropping below 66 mg/dl, the candidate must take appropriate action such as ingesting 15 grams of fast-acting carbohydrate.

Before starting the observation period, the screening physician should inform the candidate that the goal is to maintain all pre-shift and on-duty blood sugars between 66-399 mg/dl. To accomplish this, candidates should be encouraged to practice on their own and to make any necessary adjustments prior to starting the observation period. Additionally, the screening physician should stress the need for compliance with the timing of the testing regimen, as late or missed tests will be considered to be equivalent to those which are out of range.

During the observation period, candidates should provide their BG meter to the screening physician at 4-6 week intervals for downloading. Submission of BG meter printouts from candidates is not acceptable, since the BG meter software allows the user to alter the data prior to printing. Screening physicians can obtain the required software and cables from the manufacturer at no cost.

After reviewing the BG meter data, the physician should discuss out-of-range and missed tests with the candidate. There may be occasions when the candidate questions the results of a test and immediately repeats it. An inaccurate result could result from technique errors, such as failure to cleanse and dry fingers appropriately. If a second test is completed within 2-3 minutes, the physician may consider it. However, frequent retests (>1-2/month) should be discussed with the candidate. In addition, if recurrent missed tests result from scheduling conflicts with other activities, the screening physician may consider changing the test days and start times for future testing.

At the end of the three-month observation period, the physician should be able to estimate the number of times per year that the candidate will be on restricted duty (counting any missed values as out-of-range). For example, if there was one excursion out of the required range during the three-month observation period, the physician can advise the hiring agency that the candidate will likely experience four episodes of short-term restricted duty per year (for exact wording of this advisement see Phase III below). For those with zero excursions or missed values, no advisement is necessary.

In certain cases, an extension of the observation period beyond three months may be advantageous to the candidate. For example, if the candidate experienced one or two excursions/misses during the three month observation period, an additional three months of monitoring with zero excursions or misses would allow the physician to reduce the estimate for the frequency of restricted duty periods in half. This option should be discussed and offered to the candidate.

Phase III - Required Conditions for Employment

To ensure that neither acute nor chronic complications of diabetes create a direct threat of harm to themselves or others, it is critically important for candidates to agree to the following conditions:

Acute Complications: Candidates should sign an agreement that obligates them to perform SMBG while on duty (except for Group I, Level 1 candidates; see below) and to take appropriate action for values that are out of range. Additionally, since type 2 diabetes is usually a progressive disease with the eventual need for more intensive therapy, these candidates must agree to notify the employer's designated health care professional if their medication regimen is significantly altered. Finally, since an episode of severe hypoglycemia (even while off duty or asleep) creates a period of particularly high risk for a recurrent episode, the candidate must also agree to immediate notification of such an event. Verification of these conditions also requires that candidates agree to periodically provide their diabetic records for review by the employer's designated health care professional.

Chronic Complications: The potential for development of chronic complications warrants that the special examination procedures recommended above in Phase I (i.e. color vision, monofilament, orthostatic blood pressure, and stress testing) be repeated periodically. As a balance between the cost of these examinations and the probability of detecting a condition that would warrant restrictions, it is recommended that their procedures be repeated every five years for candidates who either have had diabetes for less than 10 years, or who have demonstrated good glycemic control (A1C levels predominately <7.0%). Retesting in other candidates should be performed every two years. Also, per the recommendations of the A.D.A., a dilated retinal exam by a vision specialist should be performed at least every two years for all candidates.

Sample Pre-Placement Agreements (Form III-1 - Form III-5) are provided for each evaluative group and level described in Phase II. Note that all of the agreements for Group I candidates include an admonishment that more intensive on-duty monitoring may be required after hire if their condition worsens.

Once the agreement is signed and returned to the screening physician, the evaluation process may be completed by informing the hiring agency of any restrictions identified in Phase I. Additionally, except for Group I, Level 1 candidates, the screening physician should advise the hiring agency that the following accommodations are necessary for the candidate to perform safety-related duties without posing a direct threat of harm to oneself or others:

(1) The candidate must be allowed several minutes for blood glucose testing while on duty. This will be necessary at least ___ [insert frequency excluding pre-shift test] times per ___ [insert number of hours] hour shift. Testing could be deferred if the candidate is responding to an emergency situation.

(2) The candidate must be allowed to carry glucose tablets or oral gel.

(3) The candidate is medically authorized to self-identify brief periods of time (usually lasting 30-60 minutes) during which he/she is not fit to perform safety-related duties. It is anticipated that these periods will occur approximately ____ times per year [the frequency of restricted duty periods was estimated above in Phase II. Note: this advisement can be omitted for candidates who had no out-of-range excursions or missed tests during Phase II].

c. MONITORING ON THE JOB COMPLIANCE:

As discussed above, the mitigation of the risks posed by a diabetic officer requires that the candidate agree to numerous conditions. However, the effectiveness of the pre-placement agreement depends in large part on enforcement of these provisions by the employer. This requires the services of a health care professional (HCP) to monitor compliance with the agreement.

The duties of the HCP include the following:

1) Designating the times at which the officer must perform on-duty SMBG

2) Critically reviewing documentation provided by the officer regarding any failure to perform SMBG at the designated times

3) Downloading of the officer's BG meter at intervals of 1-2 months

4) Assessing the need for changes in on-duty SMBG protocols based on changes in therapy or A1C levels per POST guidelines

5) Placing the officer on restricted duty if indicated by POST guidelines

6) Reviewing medical records to determine if the officer has failed to report initiation of insulin therapy, an episode of impairment, or has failed to obtain proper eye examinations

7) Reporting compliance violations to the employer for possible disciplinary action

8) Conducting a periodic medical work fitness evaluation to determine if any chronic complications have developed that may pose a direct threat of harm in the performance of peace officer duties

The HCP selected should be a physician who has a thorough knowledge of the P.O.S.T. diabetes guidelines. However, this physician could delegate many of the duties listed above to an ancillary HCP under his/her supervision, such as a registered nurse, or other health professional having certification in diabetes education (C.D.E.). Moreover, since the responsibilities of the HCP may necessitate placing work restrictions on the officer and/or reporting violations that could lead to disciplinary action, including discharge, it is critically important that the HCP selected by the employer be free of any conflict of interest that could inhibit the performance of such duties.

Form III-I Pre-Placement Agreement for Group I, Level 1

Diabetes Controlled with Diet and/or a Biguanide (Glucophage), Alpha-Glucosidase Inhibitor (Precose, Glyset), or a Thiazolidinedione (Actos, Avandia), and A1C <7.0%, and Historical Glycemic Levels >65 and <400 mg/dl.

Form III-2 Pre-Placement Agreement for Group I, Level 2

Diabetes Controlled with Diet and/or a Biguanide (Glucophage), Alpha-Glucosidase Inhibitor (Precose, Glyset), or a Thiazolidinedione (Actos, Avandia), and A1C ≥7.0%, or Historical Glycemic Levels Occasionally >400 mg/dl. Also Includes All Candidates Who Use a Meglitinide (Prandin), or D-Phenylalanine Derivative (Starlix).

Form III-3 Pre-Placement Agreement for Group I, Level 3

Diabetes Controlled with a Sulfonylurea, with A1C <7.0%, and Historical Glycemic Levels <400 mg/dl.

Form III-4 Pre-Placement Agreement for Group I, Level 4

Diabetes Controlled with a Sulfonylurea, with A1C ≥7.0%, or Historical Glycemic Levels ≥ 400 mg/dl.

Form III-5 Pre-Placement Agreement for Group 2

Diabetes Controlled with Insulin.

Form III-1

PRE-PLACEMENT AGREEMENT

I, _____, agree to the following as conditions of employment as a peace officer for the _____. I understand that these conditions are offered to me as an accommodation for my medical condition of diabetes.

1) I will obtain A1C testing every 6 months from my doctor, and will inform the agency's designated health care professional (HCP) before my next shift if any A1C level is greater than or equal to 7.0%. I understand that this will obligate me to begin self-monitoring my blood sugars while on duty, and to maintain my blood sugars in a range of 66-399 mg/dl.

2) I will obtain a dilated retinal examination from a vision specialist at least every two years, and will inform the HCP before my next shift if laser photocoagulation is recommended or performed.

3) If I begin using insulin or a new oral medication on an intermittent or regular basis to control my diabetes, I will notify the HCP before my next shift. I understand that use of these medications will result in the need for me to begin self-monitoring of my blood sugars while performing peace officer duties, and to maintain my blood sugar in a range of 66-399 mg/dl.

4) I will report any episodes of impaired mental abilities or altered consciousness to the HCP either on the day of occurrence, or before beginning my next shift, regardless of whether the episode occurs on or off duty.

5) To verify compliance with items 1-4 above, I agree to provide the HCP with full access to the medical and pharmacy records related to my diabetes upon request. I understand that these will be requested on a routine basis every 1-2 years.

6) I consent to medical work fitness examinations by the HCP every 2-5 years to ensure that I have not developed any chronic complications that may pose a direct threat of harm to myself or others while on duty.

7) I understand that failure to comply with this agreement could result in work restrictions and/or disciplinary action, including discharge.

By my signature below, I acknowledge that I have read and accept the conditions of this agreement.

_____ _____

Signature Witness Signature

_____ _____

Date Date

Form III-2

PRE-PLACEMENT AGREEMENT

I, _____, agree to the following as conditions of employment as a peace officer for the _____. I understand that these conditions are offered to me as an accommodation for my medical condition of diabetes.

1) While performing duties as a peace officer, I agree to test my blood sugar using a blood glucose meter designated by the agency's designated health care professional (HCP) at the start of my work shift and two hours following each on-duty meal. The specific times at which testing must be performed will be designated by the agency's HCP.

2) I understand that the test must be conducted within a time frame that commences 5 minutes before the specified testing time and ends 5 minutes thereafter. If, on occasion, I am not able to perform testing within this designated time frame, I must record and/or obtain sufficient documentation indicating that my failure to test was due to circumstances beyond my control. I must maintain this documentation and agree to provide it to the HCP upon request.

3) If my blood glucose reading is 66-89 mg/dl during any of these tests, I agree to raise my blood sugar by consuming a fast-acting carbohydrate. Furthermore, I agree to retest my blood sugar within 30 minutes. If upon this repeat testing, my blood sugar is not 90 mg/dl or higher, I agree to repeat ingestion of additional fast-acting carbohydrate and blood sugar testing as necessary to raise my blood sugar to 90 mg/dl or higher.

4) If my blood glucose meter reading is less than 66 mg/dl during any of these tests, I agree to inform my supervisor that I am not fit to perform safety-related duties. I will then attempt to raise my blood sugar by consuming a fast-acting carbohydrate. I may return to full duty if retesting of my blood sugar after 30 minutes indicates a glycemic level of 90 mg/dl or higher.

5) If my blood glucose meter reading is greater than 399 mg/dl during any of these tests, I agree to inform my supervisor that I am not fit to perform safety-related duties. I may return to full duty when retesting of my blood sugar, to be performed a minimum of at least every 30-60 minutes, indicates a glycemic level of 399 mg/dl or lower.

6) I agree to provide the blood glucose meter that I use for testing pursuant to this agreement to the HCP for downloading. I understand that I may be required to do this as frequently as once per month.

7) If I begin using insulin or a new oral medication even on an intermittent basis to control my diabetes, I will notify the HCP before my next shift. I understand that use of these medications will result in the need for me to increase the frequency of on-duty blood sugar testing.

8) I will report any episodes involving impaired mental abilities or altered consciousness to the HCP either on the day of occurrence or before beginning my next shift, regardless of whether this occurs on or off duty.

9) I will obtain a dilated retinal examination from my vision specialist a minimum of every two years, and will inform the HCP before my next shift if laser photocoagulation is recommended or performed.

10) To verify compliance with items 7-9 above, I agree to provide the HCP with full access to the medical and pharmacy records related to my diabetes upon request. I understand that these will be requested on a routine basis every 1-2 years.

11) I consent to a medical work fitness examination conducted by the HCP every 2-5 years to ensure that I have not developed any chronic complications that may pose a direct threat of harm to self or others

12) I understand that failure to comply with this agreement could result in work restrictions and/or disciplinary action, including discharge.

By my signature below, I acknowledge that I have read and accept the conditions of this agreement.

_____	_____
Signature	Witness Signature
_____	_____
Date	Date

Form III-3

PRE-PLACEMENT AGREEMENT

I, _____, agree to the following as conditions of employment as a peace officer for the _____. I understand that these conditions are offered to me as an accommodation for my medical condition of diabetes.

1) While performing duties as a peace officer after completion of a training academy, I agree to test my blood sugar using a blood glucose meter designated by the agency's designated health care professional (HCP) at the start of my work shift and every four hours thereafter. The specific times at which testing must be done will be designated by the agency's HCP

2) I understand that the test must be conducted within a time frame that commences 5 minutes before the specified testing time and ends 5 minutes thereafter. If, on occasion, I am not able to perform testing within this designated time frame, I must record and/or obtain sufficient documentation indicating that my failure to test was due to circumstances beyond my control. I must maintain this documentation and agree to provide it to the HCP upon request.

3) If my blood glucose reading is 66-89 mg/dl during any of these tests, I agree to raise my blood sugar by consuming a fast-acting carbohydrate. Furthermore, I agree to retest my blood sugar within 30 minutes. If upon this repeat testing, my blood sugar is not 90 mg/dl or higher, I agree to repeat ingestion of additional fast-acting carbohydrate and blood sugar testing as necessary to raise my blood sugar to 90 mg/dl or higher.

4) If my blood glucose meter reading is less than 66 mg/dl during any of these tests, I agree to inform my supervisor that I am not fit to perform safety-related duties. I will then attempt to raise my blood sugar by consuming a fast-acting carbohydrate. I may return to full duty if retesting of my blood sugar after 30 minutes indicates a glycemic level of 90 mg/dl or higher.

5) If my blood glucose meter reading is greater than 399 mg/dl during any of these tests, I agree to inform my supervisor that I am not fit to perform safety-related duties. I may return to full duty when retesting of my blood sugar, to be performed a minimum of at least every 30-60 minutes, indicates a glycemic level of 399 mg/dl or lower.

6) I agree to provide the blood glucose meter that I use for testing pursuant to this agreement to the HCP for downloading. I understand that I may be required to do this as frequently as once per month.

7) If I begin using insulin on an intermittent or regular basis to control my diabetes, I will notify the HCP before my next shift. I understand that use of this medication will result in the need to increase the frequency of on-duty blood sugar testing.

8) I will report any episodes involving impaired mental abilities or altered consciousness to the HCP either on the day of occurrence or before beginning my next shift, regardless of whether this occurs on or off duty.

9) I will obtain a dilated retinal examination from my vision specialist a minimum of every two years, and will inform the HCP before my next shift if laser photocoagulation is recommended or performed.

10) I will obtain A1C testing every 6 months from my treating physician, and will inform the agency's HCP before my next shift if any A1C level is greater than or equal to 7.0%. I understand that this will result in the need to increase the frequency of on-duty blood sugar testing.

11) To verify compliance with items 7-10 above, I agree to provide the HCP with full access to the medical and pharmacy records related to my diabetes condition upon his or her request. I understand that these will be requested on a routine basis every 1-2 years.

12) I consent to a medical work fitness examination conducted by the HCP every 2-5 years to ensure that I have not developed any chronic complications that may pose a direct threat of harm to self or others

13) I understand that failure to comply with this agreement could result in work restrictions and/or disciplinary action, including discharge.

By my signature below, I acknowledge that I have read and accept the conditions of this agreement.

_____	_____
Signature	Witness Signature
_____	_____
Date	Date

Form III-4

PRE-PLACEMENT AGREEMENT

I, _____, agree to the following as conditions of employment as a peace officer for the _____. I understand that these conditions are offered to me as an accommodation for my medical condition of diabetes.

1) While performing duties as a peace officer, I agree to test my blood sugar using a blood glucose meter designated by the agency's designated health care professional (HCP), at the start of my work shift, every four hours thereafter, and at two hours after each on-duty meal. The specific times at which testing must be done will be designated by the agency's HCP

2) I understand that the test must be conducted within a time frame that commences 5 minutes before the specified testing time and ends 5 minutes thereafter. If, on occasion, I am not able to perform testing within this designated time frame, I must record and/or obtain sufficient documentation indicating that my failure to test was due to circumstances beyond my control. I must maintain this documentation and agree to provide it to the HCP upon request.

3) If my blood glucose meter reading is 66-89 mg/dl during any of these tests, I agree to raise my blood sugar by consuming a fast-acting carbohydrate. Furthermore, I agree to retest my blood sugar within 30 minutes. If upon this repeat testing, my blood sugar is not 90 mg/dl or higher, I agree to repeat ingestion of additional fast-acting carbohydrate and blood sugar testing as necessary to raise my blood sugar to 90 mg/dl or higher.

4) If my blood glucose meter reading is less than 66 mg/dl during any of these tests, I agree to inform my supervisor that I am not fit to perform safety-related tasks. I must then attempt to raise my blood sugar by consuming a fast-acting carbohydrate. I may return to full duty if retesting of my blood sugar after 30 minutes indicates a glycemic level of 90 mg/dl or more.

5) If my blood glucose meter reading is more than 399 mg/dl during any of these tests, I agree to inform my supervisor that I am not fit to perform safety-related tasks. I may return to full duty when retesting of my blood sugar, which I will perform at least every 30-60 minutes, indicates a glycemic level of 399 mg/dl or less.

6) I agree to provide the blood glucose meter that I use for testing pursuant to this agreement to the HCP for downloading. I understand that I may be required to do this as frequently as once per month.

7) If I begin using insulin on an intermittent or regular basis to control my diabetes, I will notify the HCP before my next shift. I understand that use of this medication will result in the need to increase the frequency of on-duty blood sugar testing.

8) I will report any episodes involving impaired mental abilities or altered consciousness to the HCP either on the day of occurrence or before beginning my next shift, regardless of whether this occurs on or off duty.

9) I will obtain a dilated retinal examination from my vision specialist a minimum of every two years, and will inform the HCP before my next shift if laser photocoagulation is recommended or performed.

10) To verify compliance with items 7-9 above, I agree to provide the HCP with full access to the medical and pharmacy records related to my diabetes condition upon his or her request. I understand that these will be requested on a routine basis every 1-2 years.

11) I consent to a medical work fitness examination conducted by the HCP every 2-5 years to ensure that I have not developed any chronic complications that may pose a direct threat of harm to self or others

12) I understand that failure to comply with this agreement could result in work restrictions and/or disciplinary action, including discharge.

By my signature below, I acknowledge that I have read and accept the conditions of this agreement.

_____	_____
Signature	Witness Signature
_____	_____
Date	Date

Form III-5

PRE-PLACEMENT AGREEMENT

I, _____ agree to the following as conditions of employment as a peace officer for the _____. I understand that these conditions are offered to me as an accommodation for my medical condition of diabetes.

1) While performing duties as a peace officer after completion of a training academy, I agree to test my blood sugar using a blood glucose meter designated by the agency's designated health care professional (HCP), at the start of my work shift and every two hours thereafter. The specific times at which testing must be done will be designated by the agency's HCP

2) I understand that the test must be conducted within a time frame that commences 5 minutes before the specified testing time and ends 5 minutes thereafter. If, upon occasion, I am not able to perform testing within this designated time frame, I must record and/or obtain sufficient documentation indicating that my failure to test was due to circumstances beyond my control. I must maintain this documentation and agree to provide it to the HCP upon request.

3) If my blood glucose reading is 66-99 mg/dl during any of these tests, I agree to raise my blood sugar by consuming a fast-acting carbohydrate. Furthermore, I agree to retest my blood sugar within 30 minutes. If upon this repeat testing, my blood sugar is not 100 mg/dl or higher, I agree to repeat ingestion of additional fast-acting carbohydrate and blood sugar testing as necessary to raise my blood sugar to 100 mg/dl or higher.

4) If my blood glucose meter reading is less than 66 mg/dl during any of these tests, I agree to inform my supervisor that I am not fit to perform safety-related tasks. I must then attempt to raise my blood sugar by consuming a fast-acting carbohydrate. I may return to full duty if retesting of my blood sugar after 30 minutes indicates a glycemic level of 100 mg/dl or more.

5) If my blood glucose meter reading is more than 399 mg/dl during any of these tests, I agree to inform my supervisor that I am not fit to perform safety-related tasks. I may return to full duty when retesting of my blood sugar, which I will perform at least every 30-60 minutes, indicates a glycemic level of 399 mg/dl or less.

6) I agree to provide the blood glucose meter that I use for testing pursuant to this agreement to the HCP for downloading. I understand that I may be required to do this as frequently as once per month.

7) I will report any episodes involving impaired mental abilities or altered consciousness to the HCP either on the day of occurrence or before beginning my next shift, regardless of whether this occurs on or off duty.

8) I will obtain a dilated retinal examination from my vision specialist a minimum of every two years, and will inform the HCP before my next shift if laser photocoagulation is recommended or performed.

9) To verify compliance with items 7-8 above, I agree to provide the HCP with full access to the medical and pharmacy records related to my diabetes condition upon his or her request. I understand that these will be requested on a routine basis every 1-2 years.

10) I consent to a medical work fitness examination conducted by the HCP every 2-5 years to ensure that I have not developed any chronic complications that may pose a direct threat of harm to self or others

11) I understand that failure to comply with this agreement could result in work restrictions and/or disciplinary action, including discharge.

By my signature below, I acknowledge that I have read and accept the conditions of this agreement.

_____ _____

Signature Witness Signature

_____ _____

Date Date

2) PARATHYROID DISORDERS

Asymptomatic hypercalcemia is usually caused by primary hyperparathyroidism. Depending on the degree of elevation, excess calcium may cause fatigue, depression, mental confusion, anorexia, nausea, vomiting, constipation, or cardiac arrhythmias. Kidney stones may be associated with hypercalcemia, and the possibility of an underlying malignancy causing hypercalcemia should be considered.

Undiagnosed abnormalities in calcium levels require evaluation, diagnosis, and treatment before medical clearance. Calcium and phosphorous levels should be in an acceptable range based on two testings conducted at least one month apart.

3) HYPER AND HYPOTHYROIDISM

Hyperthyroidism commonly causes nervousness, emotional lability, inability to sleep, tremors, frequent bowel movements, excessive sweating and heat intolerance. Muscle weakness and weight loss may progress to the point where stair climbing is difficult. Cardiovascular disorders, such as atrial fibrillation or congestive heart failure, may occur. Hypothyroidism often has an insidious onset and includes symptoms such as lethargy, constipation, stiffness or cramping of muscles, or carpal tunnel syndrome. Intellectual activity slows, hair loss may occur, and the voice may become hoarse.

Thyroid abnormalities require evaluation, diagnosis, and treatment prior to medical clearance. Stable thyroid levels (Free T4, & TSH) in the normal range should be obtained from two testings conducted at least one month apart. Candidates on thyroid replacement should be asymptomatic and have normal or low TSH levels.

4) ADRENAL DISORDERS

The adrenal glands produce corticosteroids that affect metabolism and sodium-potassium balance in the body, catecholamines that regulate heart rate, blood pressure and sweating, and other body responses. Corticosteroid insufficiency is characterized by fatigability, weakness, anorexia, nausea, vomiting, hypotension, or hypoglycemia. Excess corticosteroids may cause hypertension, glucose intolerance, psychologic conditions and gastrointestinal problems.

Adrenal abnormalities require evaluation, diagnosis, and treatment before medical clearance. No cardiac arrhythmia or hypertension should be present. Sodium and potassium should be in normal range. Candidates with hypoadrenalism should document their ability to perform vigorous physical activity under stress and adverse environmental conditions without weakness or compromised function. Acceptable documentation may include review of current job duties, work attendance records, medical records and recreational activities.

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GASTROINTESTINAL SYSTEM[1]

I. INTRODUCTION

A. OUTLINE OF HIGHLIGHTED CONDITIONS

1) Hernias

2) Hemorrhoids

3) Ulcerative Colitis

4) Irritable Bowel Syndrome

5) Peptic Ulcers

6) Hepatitis

B. IMPLICATIONS FOR JOB PERFORMANCE

Gastrointestinal conditions can impair patrol officer performance for diverse reasons. Hernias can result in sudden incapacitation. Hemorrhoids can interfere with prolonged sitting. Other conditions can cause chronic fatigue, frequent diarrhea, and require extensive sick leave.

II. EVALUATION OF COMMON CLINICAL CONDITIONS

1) HERNIAS:

a. GENERAL CONSIDERATIONS:

During high static exertion, increased intra-abdominal pressure can cause herniation of the bowel through inguinal and ventral abdominal wall defects with resulting pain, incarceration, and potential strangulation. This could occur during a variety of typical patrol officer activities, including:

- Lifting and carrying incapacitated persons and other very heavy objects without assistance;

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[1]Author: R. Leonard Goldberg, M.D.
Participating Specialists: Craig Johanson, M.D.; Ralph Koldinger, M.D.; Michael Lawson, M.D.

- Pushing heavy objects such as vehicles;
- Breaking down locked doors;
- Subduing combative subjects.

The resulting pain could be sufficient to cause sudden incapacitation, resulting in a direct threat to self and others.

Surgical repair, including the newer outpatient laparoscopic techniques, is very successful for inguinal and ventral hernias unless the latter is secondary to medium-to-large incisional defects.

b. RECOMMENDED EVALUATION PROTOCOL:

When a hernia is suspected, a surgical consultation is necessary to confirm the diagnosis and to correct the condition. Employment decisions should be deferred until the surgeon clears the candidate for very heavy lifting and participation in contact sports. This typically involves 4 weeks for open repair or 2-3 weeks for a laparoscopic repair of an inguinal hernia (Millikan and Deziel, 1996).

2) HEMORRHOIDS

Although there is no risk of sudden incapacitation, symptomatic hemorrhoids can make prolonged sitting quite uncomfortable. Current treatment of hemorrhoids is usually non-invasive and very successful within a short period of time.

For these reasons, the employment of candidates with symptomatic, prolapsed, or significantly bleeding hemorrhoids should be deferred until successfully treated. Attention to precipitating factors, such as chronic constipation, should be addressed.

3) ULCERATIVE COLITIS

a. GENERAL CONSIDERATIONS:

Ulcerative colitis (UC) is a chronic disorder of generally unpredictable course characterized by remissions and recurrences. This condition has relevance to the patrol officer position for several reasons:

- Manifestations, such as frequent diarrhea and urgency, can interfere with an officer's ability to conduct surveillances.

- Secondary anemia, weakness, arthritis, or fatigue can limit an officer's functional capacity during a critical incident.

- Use of sick leave may be in excess of the amount which can be reasonably accommodated by the hiring agency.

It is a common misconception among both patients and physicians that stress can exacerbate UC. The preponderance of evidence and the consensus opinion among gastroenterologists is that stressful life events or depressed mood do not precipitate exacerbations (North, et al., 1991; Helzer, et al., 1984).

Although the severity of symptoms is generally proportional to the amount of bowel involved, this can vary greatly, as can the response to medication. Fortunately, the typical candidate has had only a single episode of "colitis," (which may have been infectious in origin), or has an established disease that is now in remission or well-controlled on medication.

Ulcerative proctitis is the mildest form of UC. Approximately 40% will have a permanent remission after the first attack. Only 10-15% will develop more extensive disease, and the majority will do so within the first year or two after the initial attack (Powell-Tuck, et al., 1977). The risk of progression is somewhat higher if the onset is before age 21.

When UC extends beyond the rectum, 60% will develop relapsing disease, and 20% will suffer chronic unremitting symptoms (Bayless, 1988). One study found that 50% of patients were symptomatic at any one time (Henriksen, et al., 1985). The extent of colonic involvement is associated with the severity of the disease, but does not affect the probability of recurrence. A minority of patients will develop extraintestinal manifestations such as arthritis, uveitis, or skin disease (Bayless, 1988). Those with pancolitis are at an increased risk of colon cancer (0.5-1% per year) if they have had the disease for 10 years or more (Sugita, et al., 1991).

Therapy can substantially alter the course of the disease. Treatment with 5-aminosalicylic acid drugs (sulfasalazine, mesalamine, olsalazine, or balsalazide) can be used to reduce symptoms and prevent recurrences. Maintenance therapy in asymptomatic patients with negative sigmoidoscopic findings will keep recurrence rates below 20% (Misiewicz, et al., 1965; Dissanayake & Truelove, 1973; Azad, et al. 1980). However, approximately, 5-15% of patients with mild-moderate disease will still require surgery within 10 years (Sinclair & Brunt, 1983); 30-50% of those who present with pancolitis will have surgery within 2-3 years (Bayless, 1988; Podolsky, 1991). Total procotocolectomy is curative, but is associated with a mortality rate of up to 2% (Bayless, 1988).

b. RECOMMENDED EVALUATION PROTOCOL:

The physician must obtain a detailed history of the course, complications, and treatment. Candidates must be questioned regarding the number of bowel movements per day, the presence of blood or mucus, urgency, fever, joint or abdominal pain, uveitis, skin manifestations, and the use of sick leave over the past two years. Review of medical records is strongly recommended. Documentation of sick leave use for the past two years is also helpful. If a candidate has had colonic disease for more than 10 years, it is prudent to require a colonoscopy (or review the results of one performed within the last two years) to evaluate pre-malignant changes and the need for surgery (Glickman, 1987). Testing of CBC, sed rate, stool occult blood, and C-reactive protein is helpful.

GROUP I: HISTORY OF ONE EPISODE ONLY AND CURRENTLY ASYMPTOMATIC

In general, restrictions cannot be justified unless the episode was recent. In this case, a deferral period of one year to observe the course of the disease may be justified since most of those who suffer relapses will do so within this time period (Glickman, 1987).

GROUP II: HISTORY OF RELAPSING DISEASE

Assessing the risk of recurrences and associated morbidity is best done by consideration of the applicant's past history. There are no effective laboratory tests to serve as markers for severity or recurrence risk. However, if the applicant claims to be in remission currently, this can be supported by testing of acute phase reactants such as serum sedimentation rate and C-reactive protein (Cronin, 1998), and stool occult blood.

<u>Level 1: Asymptomatic, sick leave use has not been excessive, sed rate, C-reative protein, stool occult blood and CBC are normal</u>

In general, no restrictions are warranted since these candidates are in remission. However, if the applicant is on corticosteroids, emotional lability is a potential side-effect of concern. This should be evaluated through review of medical records and psychological screening.

<u>Level 2: In remission, but use of sick leave over last two years exceeds that normally available</u>

Advise the hiring agency to consider whether the applicant's use of sick time can be reasonably accommodated.

Level 3: Currently symptomatic or anemic

Work limitations regarding surveillance or exercise-related activities may be justified on an individual basis. Advise the hiring agency if excessive use of sick leave is probable.

4) IRRITABLE BOWEL SYNDROME

a. GENERAL CONSIDERATIONS:

Irritable bowel syndrome may present as chronic recurring periods of diarrhea or constipation which may be associated with pain. Although this condition is characterized by an absence of detectable organic pathology, it may have a negative impact on performance as a patrol officer due to the following considerations:

- Urgent diarrhea may disrupt surveillances;
- Most patients will have abnormal scores on general psychological testing due to hysteria, anxiety, or depression;
- It is sometimes treated with drugs that have sedative side-effects, such as Lomotil, codeine, dicyclomine, or various anti-anxiety agents;
- 75% of those seeking medical treatment will not have permanent remissions;
- Psychological stress may trigger an exacerbation of symptoms in some patients (Dancey, et al., 1995; Schuster, 1982; LaMont & Isselbacher, 1987).

The last consideration is particularly relevant, given the high degree of emotional stress associated with the patrol officer position. Research has shown that the job of policing is an extremely stressful occupation (Cooper, 1982; Hurrell, 1977; Kroes, 1976; Rubinstein, 1973; Davidson & Veno, 1977; Farmer, 1990).

b. RECOMMENDED EVALUATION PROTOCOL:

The physician must assess the manifestations of the syndrome (diarrhea vs. constipation), course, severity, treatment, and relation to stress from thorough questioning of the candidate and a review of all relevant medical records. If diarrhea is present, determine whether it is present only in the morning or throughout the entire day. The physician should also confirm that a diagnostic evaluation was performed to rule out any underlying organic disease. Documentation of sick leave use for the past two years is also helpful.

Given the prevalence of abnormal psychological profiles in this population, it may be efficient to defer any extensive medical evaluation until the candidate has successfully completed psychological screening.

GROUP I: HISTORY OF CONSTIPATION OR HISTORY OF DIARRHEA OCCURRING IN EARLY MORNING ONLY, AND NO USE OF SEDATING MEDICATIONS; SICK LEAVE USE IS NOT EXCESSIVE

It is difficult to justify restrictions for these candidates since their condition is unlikely to impair job performance, even if aggravated by stress. Use of loperamide or hyoscyamine should not cause significant sedation.

GROUP II: HISTORY OF REFRACTORY NON-A.M. DIARRHEA, USE OF SEDATING MEDICATION TO CONTROL SYMPTOMS, OR EXCESSIVE USE OF SICK LEAVE

Disease of this severity will significantly interfere with patrol officer duties; therefore, appropriate work restrictions are in order. If the candidate is currently asymptomatic, restrictions against exposure to patrol officer stress may be warranted if the medical records clearly show that stress causes severe exacerbations in this applicant.

5) PEPTIC ULCERS

Helicobacter pylori causes the majority of duodenal and gastric ulcers. Many of the remaining ulcers are caused by use of NSAIDS. After successful treatment of H. Pylori, ulcer recurrences are infrequent. Current antibiotic regimens have lowered the morbidity associated with peptic ulcers to the extent that, in general, consideration of this condition is not necessary for police applicants. The one possible exception may be an applicant who has frequent severe recurrences and has not been properly evaluated. In this case, a short deferral to allow for evaluation and treatment may be justifiable.

6) HEPATITIS

a. GENERAL CONSIDERATIONS:

The physician will have little difficulty in evaluating the rare candidate with severe symptomatic hepatitis or chronic hepatic failure. The more typical candidate is a chronic carrier of the HBV or HBC virus who claims to be asymptomatic. There are several issues of concern which are relevant to performing essential police duties:

1) The risk of infecting others (see Infectious Diseases chapter),

2) The applicant's current physical state, and

3) The probability of significant deterioration in the immediate future.

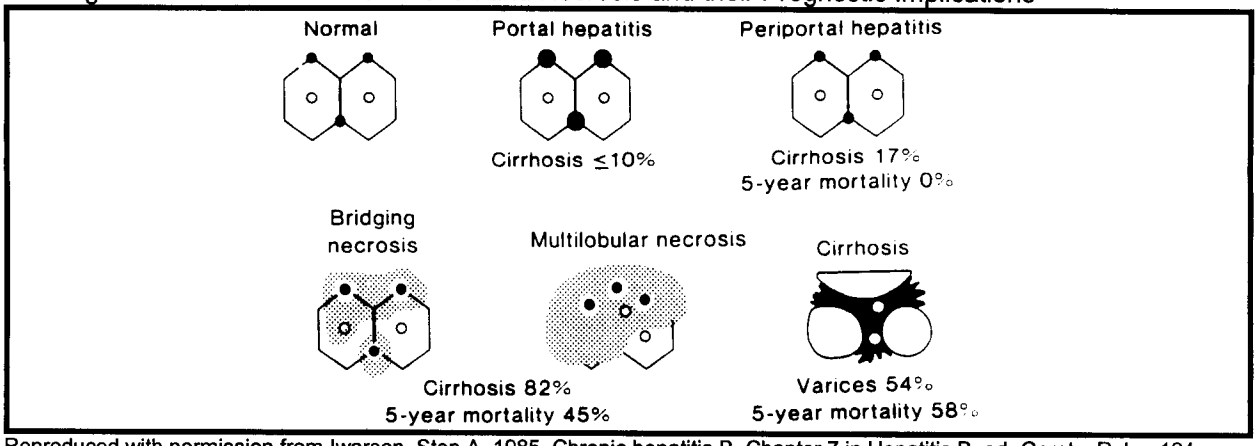
Regarding the applicant's current physical state, the most common problems are malaise and easy fatigability. However, anorexia, nausea, right upper quadrant pain, and weight loss can occur. Review of medical records and possibly sick leave records is very important to determine the severity of symptoms, and whether they would interfere with the performance of police duties.

If the candidate is presently asymptomatic or the symptoms are not severe, an assessment is necessary as to whether he or she will be able to perform patrol officer duties in the immediate future (i.e., 2 years). Unfortunately, the absence of symptoms is an unreliable indicator of the underlying clinical state and future prognosis. Deterioration of functional ability could be due to progression of the disease or the initiation of interferon therapy. Interferon is usually administered for 4 months for hepatitis B and for 12 months in combination with ribavirin for hepatitis C. Side effects which could significantly impact the performance of police duties such as fatigue and depression are common. Due to side effects, the dose of interferon has to be reduced in 10-40% of patients, and discontinued early in 5-10% (Hoofnagle, 1997).

Hepatitis B: In patients who have chronically elevated liver enzymes and HBeAg+, 50% will develop cirrhosis within 5 years (Lee,1997). Biopsy has prognostic value. Chronic persistent hepatitis characterized by inflammation limited to the portal area is generally not progressive (Bianchi, 1977) unless the patient has HBeAg+ (Aldershvile, 1982). Chronic active hepatitis may have a very poor prognosis, depending on the appearance of the biopsy (Figure IV-1). Interferon is recommended for patients with persistent elevations of liver enzymes, detectable levels of HBsAg, HBeAg, and HBV DNA in serum, and chronic hepatitis on liver biopsy (Hoofnagle 1997).

Hepatitis C: 20-50% of patients will progress to cirrhosis, but this progression is not predictable. It can develop in 1-2 years after infection, or more typically, develop in 20-30 years. Liver biopsy is not always helpful in predicting the development of cirrhosis, since even chronic active hepatitis may not be progressive (Hoofnagle, 1997). Similarly, the finding of chronic persistent hepatitis does not always indicate a benign course unlike in hepatitis B (Gerber, 1992). Treatment with interferon and ribavirin is recommended for patients with elevated aminotransferase levels, HCV-RNA in serum, and chronic hepatitis on biopsy. Side-effects of interferon therapy are similar to those in hepatitis B, but may be less severe due to lower dosing (Hoofnagle, 1997).

FIGURE IV-1
Histologic Patterns of Liver Inflammation and Necrosis and their Prognostic Implications



Reproduced with permission from Iwarson, Sten A. 1985. Chronic hepatitis B. Chapter 7 in Hepatitis B, ed. Gerety, R.J., p124. Orlando, FL: Academic Press.

b. RECOMMENDED EVALUATION PROTOCOL:

Candidates with a history of chronic HBV or HCV viral infection need to be questioned regarding symptoms such as jaundice, nausea, vomiting, easy bruisability, arthralgias, myalgias, fever, and easy fatigability. Details regarding prior evaluations and treatment are important. The physical examination should include palpation of the liver, and spleen, and inspection of the skin (spider angiomas). Laboratory analysis should include liver enzymes, platelet count, albumin, and INR. Medical record review is strongly recommended if enzymes are elevated.

GROUP I: ASYMPTOMATIC CHRONIC HBV/HCV INFECTION WITH NORMAL LIVER ENZYMES

Risk of significant progression in the immediate future is not very high.

GROUP II: ASYMPTOMATIC CHRONIC HBV/HCV INFECTION WITH ELEVATED LIVER ENZYMES

Request previous records and require an evaluation from the candidate's private physician regarding whether interferon is recommended. Temporary deferrals to assess the impact of potential side-effects would be warranted if interferon is recommended. If treatment is not recommended, assess the 2-year prognosis for significant morbidity based on the following:

a) Recent liver biopsy (if available) -- For HBV, bridging necrosis, multilobar necrosis, or cirrhosis indicate poor prognosis, especially if associated with significant inflammation. Those with a diagnosis of

CPH from a previous biopsy do not need to be rebiopsied, unless there is significant inflammation present or the candidate is HBeAg+. For HCV, only the presence of cirrhosis reliably indicates poor prognosis in the immediate future.

b) The severity and time course of past symptomatic episodes. These are likely to recur unless the candidate has taken interferon, and is in the minority of patients (<40%) who have a sustained positive response to treatment. Due to the frequency of relapses after an initial response, "success" cannot be reliably determined until 6 months after treatment has finished. At that time, liver enzymes should still be normal with no detectable HBV DNA, HBeAg, or HCV RNA (Hoofnagle, 1997).

GROUP III: SYMPTOMATIC

Restrictions are warranted if the symptoms will interfere with the safe or effective performance of essential duties. If this is not the case, evaluate the risk of significant deterioration as per GROUP II.

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HEMATOLOGY[1]

I. INTRODUCTION

A. OUTLINE OF HIGHLIGHTED CONDITIONS

1) Iron-Deficiency Anemia

2) Thalassemia

3) Bleeding Disorders

B. IMPLICATIONS FOR JOB PERFORMANCE

Anemia can limit exercise capacity and therefore an officer's ability to safely perform in the following situations:

- Running in Pursuit of Suspects: speed is important in up to 90% of incidents, distances may range up to 500 yards.
- Pursuit May Be Followed by Physical Altercation: subduing combative suspects takes an average of 3 minutes.
- Moving Incapacitated Persons: ability to lift and carry someone distances of 40+ feet when speed is critical.

These activities may require an exercise capacity of up to 12 METS (Jette, et al.,1990; see discussion in Respiratory section).

Bleeding disorders and anticoagulants increase the risk of serious complications from even minor episodes of blunt or penetrating trauma.

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[1]Author: R. Leonard Goldberg, M.D.
Participating Specialists: Solomon I. Hamburg, M.D.; Howard Liebman, M.D.; Eileen Weitz, M.D.; Jerry Powell, M.D.

II. EVALUATION OF COMMON CLINICAL SYNDROMES

1) IRON-DEFICIENCY ANEMIA (IDA)

IDA is common among candidates, especially females who are avid runners. Research has shown that running can contribute to iron loss through hematuria, subclinical GI bleeding, sweating, decreased absorption, and mechanical trauma to the foot (Eichner, 1986; Newhouse & Clement, 1988). Relatively severe IDA (hemoglobin <10 gm%) will clearly impair athletic performance (Newhouse & Clement, 1988; Celsing, et al., 1986). Impairment due to mild IDA remains controversial, but several studies provide enough evidence to warrant concern. A survey of female agricultural workers in Sri Lanka found that those with hemoglobin levels of 11.0-11.9 gm% were 20% less productive than those with levels >13 gm% (Gardner, et al., 1975). Rowland, et al. (1988) found that treatment improved treadmill performance in seven women who had mild IDA with hemoglobin levels above 12 gm%. An additional study of Guatemalan manual laborers found that short duration near-maximal exercise capacity was impaired even with the mildest degrees of anemia (Viteri & Torun, 1974). Treatment with iron substantially improved performance within one month.

Given this potential for IDA to impair performance, the physician should require candidates to undergo either dietary iron supplementation to normalize their hemoglobin levels, or exercise testing to demonstrate a capacity of at least 12 METS.

2) THALASSEMIA

Thalassemia is a genetic disorder characterized by absent or diminished synthesis of either the alpha or beta chains in the hemoglobin molecule. The prevalence of heterozygotic Thalassemia "minor" is reported to be common in African, Mediterranean, and Oriental populations. Clinically, there is usually mild microcytic anemia with hematocrits greater than 32%. Since these anemias are chronic, these patients usually have normal cardiovascular capacity. However, any question regarding a particular candidate should be assessed with an exercise test. Homozygous thalassemia ("intermedia" and "major") is a very grave condition resulting in premature death, poor growth, absent secondary sexual characteristics, and multiple endocrine deficiencies.

3) BLEEDING DISORDERS

Having a bleeding diathesis secondary to clotting disorders, or the use of warfarin, increases the risk of serious injury as a result of physical trauma associated with subduing combative suspects and other essential job functions. Bleeding into joints, the retroperitoneal area, and intra cranial bleeding are of concern. However, these complications will not cause incapacitation nor impair the performance of

essential functions within the 5-15 minute time span typical of most critical incidents. Therefore, these candidates do not generally pose a risk of harm to others while performing patrol duties. One exception would be a candidate with severe thrombocytopenia (platelet counts < 5000) or a major platelet dysfunction disorder (Lieberman, 2001).

Intra cranial hemorrhage (ICH) from minor head trauma poses the greatest risk of harm to self. In untreated patients with hemophilia, this occurs following about 10% of head injuries (unselected for severity), and has a mortality rate of 20-50%. However, Andes, et al. (1984) found that ICH can be prevented if clotting factors are administered within 6 hours of the head trauma. This could be done in an ER or by self-administered infusions. Some patients with severe factor deficiencies may have a history of spontaneous bleeding into joint spaces with sports activities. However, this can usually be prevented with prophylactic home infusions 2-3 times per week. Trauma from wrestling and other self-defense training at the academy may cause muscle hematomas. However, this can also be prevented with prophylactic treatment. [Note: there is at least one professional hockey player with hemophilia (DeBenedette, 1992).]

An acceptable candidate should meet the following criteria:

1. No history of severe thrombocytopenia (platelet counts < 5000) or a major platelet dysfunction disorder,

2. Demonstrated history of successful participation in contact sports without recurrent bleeding complications,

3. Documentation via medical records that the candidate possesses adequate knowledge of his/her disease and has acted responsibly in the past to obtain therapy in a timely manner,

4. Absence of permanent joint damage which would interfere with the safe performance of duties (see Musculoskeletal section).

5. Absence of advanced infectious disease (i.e., hepatitis B/C, and HIV) which would impair the performance of duties over the next two years (see Infectious Disease section.)

6. Written acknowledgment from the candidate that he/she is aware of the following facts and associated personal risks:

    - The mortality from ICH is 20-50%; those who survive often have permanent neurological impairment.

    - Field work creates an imminent and substantial risk of head trauma.

- To reduce the risk of ICH, it is imperative that the candidate obtain factor replacement or a medical evaluation as soon as possible following any trauma to the head or face.

- Early therapy of head trauma must not be delayed regardless of the lack of symptoms, fears of developing serum inhibitors to replacement factors, or cost considerations.

- While effective, early therapy will not eliminate the risk of death from minor head trauma in persons with severe factor deficiencies, or who have serum inhibitors to replacement factors.

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ONCOLOGY[1]

I. INTRODUCTION

A. OUTLINE OF HIGHLIGHTED CONDITIONS

Evaluating candidates with a history of tumor or malignancy poses a unique challenge to the examining physician due to the vast diversity of pathological types, stages, and methods of treatment. In addition, oncological conditions are rarely encountered in patrol officer applicants, thereby providing screening physicians with very limited experience in this area. This chapter therefore describes a generic approach to the use of readily-available informational resources to enable a physician to evaluate any candidate, regardless of tumor type or treatment regimen.

B. IMPLICATIONS FOR JOB PERFORMANCE

Tumors and the side-effects of therapy can impair a candidate's ability to perform high exertional tasks that require an exercise capacity of at least 12 METS, such as running and subduing combative arrestees (see Respiratory chapter). Fortunately, most candidates will be in remission and have no evidence of current disability. However, recurrences can threaten the candidate's ability to perform in the immediate future (i.e., 2 years).

II. MEDICAL EXAMINATION AND EVALUATION GUIDELINES

A. GENERAL SCREENING RECOMMENDATIONS

1) History: The physician must thoroughly question candidates who admit to symptoms which are potential early warning signs of tumors. These would include persistent cough or hoarseness, unexplained fevers or weight loss, recent change in bowel or bladder habits, non-healing sores, unusual bleeding or discharge, difficulty in swallowing, and obvious change in a wart or mole.

2) Examination: All candidates should have a physical examination which includes inspection of the skin and mouth, and palpation of lymph nodes and testicles. All female candidates with a family history of breast cancer in a first-degree relative should have a breast examination.

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[1]Author: R. Leonard Goldberg, M.D.
Participating Specialists: Solomon I. Hamburg, M.D.; Howard Liebman, M.D.; Eileen Weitz, M.D.

B. EVALUATION OF A CANDIDATE WITH A HISTORY OF TUMOR OR MALIGNANCY

The physician should obtain medical records regarding the pathological diagnosis, the results of the original staging, treatment, and the last follow-up exam or screening procedure. If the applicant has not had appropriate follow-up testing, it is reasonable to require that it be completed prior to the final evaluation at the candidate's expense.

The physician must assess all of the following:

1) Current disability due to direct damage from the tumor or metastases:

2) Current disability due to fatigue or opportunistic infections:

Assessing work limitations due to these factors is usually not difficult and can be done on the basis of symptoms. In certain cases, the physician should utilize functional testing such as spirometry or exercise testing (see Respiratory System).

3) Current disability due to the effects of medical, surgical, or radiation therapy:

Medical treatment can result in side-effects both during active treatment (Table VI-1) and after treatment has ceased (Table VI-2). Review of medical records and recent laboratory tests from the treating oncologist should be sufficient to detect the majority of these effects. In certain cases, additional testing should be routinely obtained (Table VI-2). Radiation therapy will have the greatest acute effects on the hematological, respiratory, and gastrointestinal systems.

4) Probability of disability in the immediate future:

Fortunately, the vast majority of candidates will be in remission, and have no disability due to the concerns (1-3) listed above. However, disability may occur in the immediate future (i.e., 2 years), due to either of the following:

a) ***Delayed effects from treatment***: While the risk of developing delayed side-effects in patients who are currently asymptomatic is low, it is advisable to require a very short deferral period (no longer than three months) for candidates who will soon complete or have just completed a course of a drug listed in Table VI-2, or radiation therapy. Delayed effects due to the latter are secondary to fibrosis which may occur in the lungs and the heart. Post-radiation applicants should be tested for pulmonary diffusing capacity, and have a echocardiogram or MUGA scan to evaluate their ejection fraction.

TABLE VI-1:
Toxicity of Anticancer Drugs and Hormones (Dose-Limiting Effects are in Bold Type)

Drug	Acute Toxicity
Altretamine	Nausea and vomiting
Aminoglutethimide	Drowsiness; nausea; dizziness; rash
Asparaginase	Nausea and vomiting; fever; chills; headache; hypersensitivity, anaphylaxis; abdominal pain; hyperglycemia leading to coma
BCG	Bladder irritation; nausea and vomiting; fever; sepsis
Bleomycin	Nausea and vomiting; fever; anaphylaxis and other allergic reactions
Busalfan	Nausea and vomiting; rare diarrhea
Carboplatin	Nausea and vomiting
Carmustine (BCNU)	Nausea and vomiting; local phlebitis
Chlorambucil	Seizures; nausea and vomiting
Cisplatin (cis-DDP)	Nausea and vomiting; anaphylactic reactions; fever; hemolytic-uremic syndrome
Cyclophosphamide	Nausea and vomiting; type 1 (anaphylactoid) hypersensitivity; facial burning with IV administration; visual blurring
Cytarabine HCl	Nausea and vomiting; diarrhea; anaphylaxis
Dacarbazine	Nausea and vomiting; diarrhea; anaphylaxis; pain on administration
Dactinomycin	Nausea and vomiting; diarrhea; local reaction and phlebitis; anaphylactoid reaction
Daunorubicin HCl	Nausea and vomiting; diarrhea; red urine (not hematuria); severe local tissue damage and necrosis on extravasation; transient ECG changes; anaphylactoid reaction
Doxorubicin HCl	Nausea and vomiting; red urine (not hematuria); severe local tissue damage and necrosis on extravasation; diarrhea; fever; transient ECG changes; ventricular arrhythmia; anaphylactoid reaction
Estramustine phosphate sodium	Nausea and vomiting; diarrhea
Etoposide (VP16-213)	Nausea and vomiting; diarrhea; fever; hypotension; allergic reactions

Table continued on next page.

TABLE VI-1 **(Continued)**:
Toxicity of Anticancer Drugs and Hormones (Dose-Limiting Effects are in Bold Type)

Drug	Acute Toxicity
Floxuridine	Nausea and vomiting; diarrhea
Fluorouracil (5-FU)	Nausea and vomiting; diarrhea; hypersensitivity reaction
Flutamide	Nausea; diarrhea
Goserelin	Transient increase in bone pain and ureteral obstruction in patients with metastatic prostate cancer; hot flashes
Hydroxyurea (hydroxy-carbamide)	Nausea and vomiting; allergic reactions to tartrazine dye
Idarubicin	Nausea and vomiting
Ifosfamide	Nausea and vomiting; confusion; nephrotoxicity; metabolic acidosis
Interferon Alfa-2a, Alfa-2b	Fever; chills, myalgias; fatigue; headache; arthralgias; hypotension
Leuprolide acetate (LHRH-releasing factor analogue)	Transient increase in bone pain and ureteral obstruction in patients with metastatic prostate cancer; hot flashes
Levamisole	Nausea and vomiting; diarrhea
Lomustine (CCNU)	Nausea and vomiting
Mechlorethamine HCl (nitrogen mustard)	Nausea and vomiting; local reaction and phlebitis
Melphalan	Mild nausea; hypersensitivity reactions
Mercaptopurine	Nausea and vomiting; diarrhea
Mesna	Nausea and vomiting; diarrhea
Methotrexate (MTX)	Nausea and vomiting; diarrhea; fever; anaphylaxis; hepatic necrosis
Mitomycin	Nausea and vomiting; local reaction; tissue necrosis; fever
Mitotane (o,p'-DDD)	Nausea and vomiting; diarrhea
Mitoxantrone HCl	Blue-green pigment in urine; blue-green sclera; nausea and vomiting; stomatitis

Table continued on next page.

TABLE VI-1 **(Continued)**:
Toxicity of Anticancer Drugs and Hormones (Dose-Limiting Effects are in Bold Type)

Drug	Acute Toxicity
Octreotide	Nausea; diarrhea; abdominal pain
Plicamycin	Nausea and vomiting; diarrhea; fever
Procarbazine HCl	Nausea and vomiting; CNS depression; disulfiram-like effect with alcohol
Streptozocin	Nausea and vomiting; local pain; chills and fever
Tamoxifen citrate	Nausea and vomiting; hot flashes; transient increased bone or tumor pain; hypercalcemia
Thioguanine	Occasional nausea and vomiting
Thiotepa	Nausea and vomiting; local pain at site of injection
Vinblastine sulfate	Nausea and vomiting; local reaction and phlebitis with extravasation
Vincristine sulfate	Local reaction with extravasation

Note: Cutaneous reactions (sometimes severe), hyperpigmentation, and ocular toxicity have been reported with virtually all nonhormonal anticancer drugs. Reproduced with permission from The Medical Letter, June 2, 1989.

TABLE VI-2:
Recommendations for Supplemental Testing* of Candidates Who are at Risk of Delayed Toxicity from Selected Anticancer Drugs

Drug	Primary Delayed Toxicity	Recommended Supplemental Tests
Bleomycin	Pulmonary fibrosis	CXR**
Busulfan	Pulmonary fibrosis	CXR**
Carmustine	Pulmonary fibrosis	CXR**
Cisplatin	Peripheral neuropathy	Thorough neurological exam
Daunorubicin	Cardiotoxicity	Cardiac stress test
Doxorubicin	Cardiotoxicity	Cardiac stress test
Melphalan	Pulmonary fibrosis	CXR**
Methotrexate	Pulmonary fibrosis	CXR**
	Hepatic toxicity	None
Mitoxantrone	Cardiotoxicity	Cardiac stress test
Vinblastine	Peripheral neuropathy	Thorough neurological exam
Vincristine	Peripheral neuropathy	Thorough neurological exam

*Routine testing of all candidates regardless of history should include spirometry, urinalysis, LFTs and complete CBCs.
**PA Chest radiograph

b) ***Tumor recurrence***: A recurrent tumor leads to recurrent treatment and potential disability. The challenge is to assess whether the cancer is likely to recur in the immediate future (i.e., 2 years), and whether any subsequent treatment would interfere with the ability to perform the essential functions of a peace officer.

To make this assessment, current information on tumor recurrence rates is essential. Potential sources include the following:

- The Surveillance, Epidemiolgy, and End Results (SEER) database. Five-year survival data is presented in Table VI-3, and should be helpful in providing a general overview of prognosis. Stratification by stage is also available from the SEER website (www-seer.ims.nci.nih.gov) for many types of tumors. This is very important for some tumors, but not for others. For example, the five-year survival rate for melanoma with distal metastases is 12% vs. 59% for patients with regional spread only. However, patients with distal spread of testicular cancer still have a 73% five-year survival. In using this data, one should be aware that survival rates are not the same as relapse-free or disease-free rates. Unfortunately, this data is not available from SEER.

- The textbook Cancer: Principles and Practice of Oncology. V.T. DiVita, S. Hellman, and S.A. Rosenberg. Philadelphia: J.B. Lippincott. Expensive but available in medical libraries.

- The medical literature. Summaries are available at several websites including NCI (http://cancernet.nci.nih.gov) and the University of Pennsylvania Cancer Center (http://oncolink.upenn.edu).

If disability is more likely than not in the immediate future, the physician may recommend a deferral of the candidate until this risk abates.

TABLE VI-3: Age-Adjusted SEER
5 - Year Survival Rates

SITE	SURVIVAL % (1989 - 1994)		SITE	SURVIVAL % (1989 - 1994)	
	Males	Females		Males	Females
Oral Cavity & Pharynx	**50**	**60**	**Respiratory System**	**18**	**18**
Lip	95	99	Nose, nasal cavity & middle ear	52	51
Tongue	44	59	Larynx	68	59
Salivary gland	67	79	Lung & bronchus	13	16
Floor of mouth	50	62	Pleura	4	15
Gum & other oral cavity	38	64	Trachea & other respiratory organs	47	46
Nasopharynx	51	52	**Bones & Joints**	**64**	**70**
Tonsil	46	47	**Soft Tissue (including heart)**	**65**	**65**
Oropharynx	27	34	**Skin (ex basal & Squam)**	**55**	**91**
Hypopharynx	28	34	Melanomas of skin Other non-epithelial skin	86 16	91 89
Other oral cavity & pharnyx	22	26	**Multiple myeloma**	**30**	**28**

Table continued on next page.

TABLE VI-3 **(Continued)**: Age-Adjusted SEER
5 - Year Survival Rates

SITE	SURVIVAL % (1989 - 1994)	
	Males	Females
Digestive System	**42**	**46**
Esophagus	12	12
Stomach	18	25
Small intestine	47	51
Colon & Rectum	62	62
Colon	64	62
Rectum	60	61
Anus, anal canal & anorectum	56	62
Liver & Intrahep:	4	8
Liver	4	9
Intrahep bile duct	3	4
Gallbladder	3	15
Other biliary	21	16
Pancreas	4	4
Retroperitoneum	52	45
Peritoneum, omentum & mesentery	20	31
Other digestive system	4	2
Male Genital System	**93**	**-**
Prostate	93	-
Testes	95	-
Penis	65	-
Other male genital system	80	-
Female Genital System	**-**	**70**
Cervix uteri	-	70
Corpus uteri	-	85
Uterus, NOS	-	25
Ovary	-	50
Vagina	-	50
Vulva	-	77
Other female genital system	-	61

SITE	SURVIVAL % (1989 - 1994)	
	Males	Females
Breast	**85**	**85**
Urinary System	**78**	**67**
Urinary bladder	85	74
Kidney & renal pelvis	62	60
Ureter	64	57
Other urinary system	72	51
Eye & Orbit	**79**	**78**
Brain & Nervous System	**31**	**30**
Brain	28	27
Cranial nerves & other nervous system	66	65
Endocrine System	**86**	**94**
Thyroid	92	96
Other endocrine & thymus	60	60
Lymphomas	**53**	**62**
Hodgkin's disease	80	95
Non-Hodgkin's & lymphomas	47	56
Leukemias	**43**	**42**
Lymphocytic:	65	66
Acute lymphocytic	57	60
Chronic lymphocytic	71	71
Other lymphocytic	36	36
Myeloid:	20	22
Acute myeloid	13	15
Chronic myeloid	30	35
Other myeloid	28	31
Monocytic:	18	16
Acute monocytic	19	13
Chronic monocytic	-	-
Other monocytic	-	-
Other:	40	25
Other acute	11	12
Other chronic	-	-
Aleukemic, subleuk & MOS	57	35
Ill-defined & Unspecified	**13**	**12**

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INFECTIOUS DISEASES[1]

I. INTRODUCTION

A. OUTLINE OF HIGHLIGHTED CONDITIONS

1) HIV

2) Chronic Viral Hepatitis

3) Tuberculosis

B. IMPLICATIONS FOR JOB PERFORMANCE

Infectious disease is of relevance to patrol officer duties for the following reasons:

- The condition (or treatment thereof) may impair the ability of the officer to perform essential duties such as heavy lifting, subduing combative arrestees, driving, or conducting surveillances.
- Anticipated use of sick leave may be more than can be reasonably accommodated by the hiring agency.
- The condition may threaten the officer's ability to perform essential duties in the immediate future (i.e., 2-3 years).
- The condition may pose a significant risk of contagion to others.

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[1]Author: R. Leonard Goldberg, M.D.
Specialist Review Panel: Ronelle Campbell, D.O.; Julie Gerberding, M.D.; Karen Lindsay, M.D.

II. MEDICAL EXAMINATION AND EVALUATION GUIDELINES

A. GENERAL SCREENING RECOMMENDATIONS

1) History:

The Medical History Statement includes routine questions regarding a history of abnormal liver tests, hepatitis, and tuberculosis. Asking whether the candidate is HIV+ would not be consistent with the intent of the California Health & Safety Code (s. 199.21f) which prohibits HIV testing to determine suitability for employment. An alternative that is more legally tenable is to limit routine inquires to those manifestations of HIV disease that are relevant to patrol officer duties. These would include severe immunodeficiency (CD4+ lymphocyte count of 500 or less), unexplained diarrhea lasting >1 month, fevers lasting >1 month, night sweats, involuntary weight loss of >10% of baseline, or chronic fatigue. However, the physician should discuss any HIV screening protocols with the hiring agency **before** implementation. The physician should also be aware that there are civil and criminal penalties for disclosing a candidate's HIV status without his/her specific authorization. A generic medical release form is not adequate.

2) Examination:

In addition to the routine physical exam recommended in other sections of this manual, the physician should conduct a thorough exam for lymphadenopathy, and inspect the oral cavity and the skin. A finding of two or more extrainguinal nodes of 1.0 cm or larger would require further evaluation, unless an obvious local infection is present. Findings of thrush or hairy leukoplakia in the mouth would also require further evaluation. Similarly, examination of the skin may reveal a Kaposi's sarcoma or multidermatomal zoster that would suggest HIV infection.

3) Routine Testing:

As discussed elsewhere in this manual, routine lab testing should include liver function tests and a CBC with differential. These tests should include serum protein and gammaglobulin. A baseline Mantoux tuberculin skin test should be obtained if the candidate will spend a considerable amount of time working in jails.

B. EVALUATION OF COMMON CLINICAL SYNDROMES

1) HIV

a. GENERAL CONSIDERATIONS:

While HIV+ candidates should be evaluated by the same guiding principles that are used with other conditions, the physician must keep in mind that there are unique legal restrictions that only apply to this disease (see General Screening Recommendations). Many of the HIV regulations are relatively recent in origin, and have not yet been interpreted by the courts. It is unclear how the courts would apply these regulations if asked to review specific medical details of the patrol officer selection process. Given this uncertainty, it would be prudent for the physician to meet with the appropriate representatives from the hiring agency to discuss HIV policy before evaluating a candidate. The physician should use this opportunity to discuss the following issues:

(1) **Relevance of HIV Infection to the Evaluation of Patrol Officer Candidates**

(2) **Selection of Appropriate Screening Protocols**

(3) **Need for Ongoing Evaluation of HIV+ Candidates After Hire**

The information presented in this section is designed to help the physician present these issues to management. Since it is important for all physicians to have a basic knowledge of HIV disease regardless of their specialty, the following discussion assumes a pre-existing informational base equivalent to that found in a standard textbook of internal medicine.

(1) **Relevance of HIV Infection to the Evaluation of Patrol Officer Candidates**

- Current Inability to Perform Patrol Officer Duties: Impairment due to HIV infection can develop directly as a result of the constitutional and neurological impact of HIV virus, or secondarily from neoplasms, drug side-effects, and opportunistic infections. Symptoms such as chronic fatigue, fevers, diarrhea, hypercatabolic wasting, dementia, and anemia can substantially interfere with the performance of patrol officer duties or require the use of sick leave beyond what can be reasonably accommodated by many agencies. One study found exercise impairment in HIV+ subjects even in the absence of symptoms or opportunistic infections (Johnson, et al., 1990).

- Risk of Significant Harm to the Candidate: Development of active TB following exposure in high risk environments (such as prisons) is a potential concern. Persons with CD4+ counts <500/mm3 are at significantly increased risk of progression to active disease after contracting mycobacterium tuberculosis (Di Perri, et al., 1991). Whereas only 5% of recent seroconverters with normal immunocompetence will develop active disease

within one year after seroconversion, a high percentage of HIV+ persons (30% in one study and 39% in another) developed active TB within months of seroconversion (Daly, et al., 1992; Small, et al., 1991). Moreover, these persons are likely to have a rapid and severe progression of illness (CDC, 1992c). However, seroconversion rates among jailers is unknown. This makes it difficult to assess whether the risk of developing active TB among HIV+ jailers with low CD4+ counts would legally constitute a direct threat. A recent study of inmates in a California state correctional institution found seroconversion rates among inmates to be only 3% per year (CDC, 1992b). One would expect that seroconversion rates among jailers would be even lower.

- Risk of Significant Harm to Others: Blood-borne diseases such as HIV may potentially be transmitted to a suspect during two possible situations: (1) if a suspect bites an officer with sufficient pressure to break the skin, the suspect could have oral mucosal exposure to the officer's blood; or (2) if blood from a lacerated officer came into contact with an open wound on the suspect. The potential risk of infection to a suspect depends on how often these situations occur and the risk of transmission per occurrence.

  How often suspects are exposed to the blood of an officer is unknown. However, a preliminary study of workers' compensation records from the Los Angeles Police Department is useful in providing a maximum estimate of the potential exposure rate. It was found that 1% of field officers annually file a claim after being bitten by a suspect (Goldberg, 1993). Another 5% of field officers annually file claims for lacerations sustained either during a pursuit of a suspect or during an altercation with a suspect. These data would suggest a potential suspect exposure rate of 6% per officer. However, the study does not specify whether bitten officers bled from their bites. Similarly, in cases of officer lacerations, it is not known whether the involved suspect had an open wound or was even contaminated by the officer's blood.

  Although the risk of contracting HIV from mucosal exposure is unknown, it is at least an order of magnitude less than the risk from a needle-stick injury (Beekmann, et al., 1990). The risk from a needle-stick injury has been recently estimated to be about 1/500 (Henderson & Gerberding, 1992), which is the best available approximation for the risk of infection following open wound exposure to infected blood. However, both of these estimates are based on exposures to AIDS patients with circulating viral titers that are orders of magnitude higher than would be expected to occur in an HIV+ person healthy enough to be a patrol officer.

  Considering that exposure situations do not occur commonly, and that the risk of transmission per occurrence is very low, it can be confidently concluded that the annual risk of a suspect becoming infected from an HIV+ officer is very remote (<1/10,000).

The potential for an HIV+ candidate to infect others with TB is of concern in jail environments. As mentioned above, certain HIV+ persons are at greater risk of developing active TB. Mitigation of this risk would require frequent skin testing of these persons.

- Probability That the Candidate Will Become Unable to Regularly Perform Essential Duties in the Immediate Future (2-3 years). Although individuals with HIV infection often remain asymptomatic for years, at least 75% will eventually develop an AIDS-defining condition (Table VII-1 - Category C) and die from the disease (Rutherford, et al., 1990). The most important independent prognostic factors appear to be the presence of an AIDS-defining condition, constitutional symptoms, the use of medications, opportunistic infections, and the CD4+ lymphocyte count. In considering these factors, it is possible to group HIV+ candidates into several prognostic categories:

  - Presence of an AIDS-Defining Condition (Table VII-1 - Category C): Regardless of other risk factors, it is more likely than not that these candidates will not survive for three years (Table VII-2). The length of time that they would be capable of unrestricted field duties would be expected to be considerably less, since death is likely to be preceded by a considerable period of disability.

  - CD4+ Count <200 Without an AIDS-Defining Condition (Table VII-1 - Category A3, B3): This group of candidates is also unlikely to be able to perform patrol officer duties in the immediate future. Eighty percent will develop an AIDS-related opportunistic infection or malignancy within three years (Philips, et al., 1991; Moss, et al., 1988; Lang, et al., 1989). In a recent study, two-year death rates were substantial even if AZT was given -- 17% for asymptomatic patients and 44% for patients with constitutional symptoms, oral hairy leukoplakia, or herpes zoster within the last six months (Neil, et al., 1992). In another 2-3 year follow-up study of patients who had a mean CD4+ count of 350/mm3, 38/43 deaths were preceded by at least one count <200/mm3 (Hamilton, et al., 1992). It is also relevant to note that the Center for Disease Control (CDC) has recently expanded their 1987 AIDS surveillance case definition to include all patients with counts <200/mm3 (CDC, 1992a).

  - CD4+ Count Between 200-499 Without AIDS-Defining Condition: The prognosis in this group of candidates is quite variable depending on the presence of constitutional symptoms, history of minor opportunistic infections (see Table VII-1, Clinical Category B), use of medications, and the level/stability of the CD4+ count. There is an extensive amount of active research on this group of patients, as well as a considerable amount of controversy. For example, in February, 1992, the VA Cooperative study of symptomatic patients found that 42% progressed to AIDS within 2-3 years if their initial CD4+ count was between 200-299

TABLE VII-1
1992 Revised CDC HIV Classification System and Expanded AIDS Surveillance Definition for Adolescents and Adults (Draft)

The revised system emphasizes the importance of CD4 lymphocyte testing in clinical management of HIV-infected persons. The system is based on 3 ranges of CD4 counts and 3 clinical categories giving a matrix of 9 exclusive categories. The system replaces the 1986 classification.

CRITERIA FOR HIV INFECTION: Persons 13 years or older with repeatedly (2 or more) reactive screening tests (ELISA) + specific antibodies identified by a supplemental test, e.g., Western blot ["reactive" pattern (CDC criteria) = + vs any two of p24, gp41, or gp120/160 (*MMWR 40:692, 1991*)]. Other specific methods of diagnosis of HIV-1 include virus isolation, antigen detection, and detection of HIV genetic material by PCR.

CLASSIFICATION SYSTEM				Clinical Category A	Clinical Category B[2]	Clinical Category C[3]
	Clinical Category*			Asymptomatic HIV infection Persistent generalized lymphadenopathy (PGL)[1] Acute (primary) HIV illness	Bacterial endocarditis, meningitis, pneumonia, sepsis Candidiasis, vulvovaginal; persistent > 1 month Candidiasis, oropharyngeal Cervical dysplasia, severe or carcinoma Constitutional sx, e.g., fever (>38.5°) or diarrhea > 1 month Hairy leukoplakia, oral Herpes zoster, ≥ 2 episodes or > 1 dermatome Idiopathic thrombocytopenic purpura Listeriosis M. tuberculosis, pulmonary Nocardiosis Pelvic inflammatory disease Peripheral neuropathy	Candidiasis; esophageal, trachea, bronchi Coccidioidomycosis, extrapulmonary Cryptococcosis, extrapulmonary Cryptosporidiosis, chronic intestinal (> 1 month) CMV retinitis, or other than liver, spleen, nodes HIV encephalopathy Herpes simplex with mucocutaneous ulcer > 1 month, bronchitis, pneumonia Isosporiasis, chronic, > 1 month Kaposi's sarcoma Non-Hodgkin's lymphoma; Burkitt's type; immunoblastic sarcoma; primary CNS lymphoma M. avium or M. kansasil, extrapulmonary M. tuberculosis, extrapulmonary Mycobacterium, other species disseminated or extrapulmonary Pneumocystis carinii pneumonia Progressive multifocal leucoencephalopathy Salmonella bacteremia, recurrent Toxoplasmosis, cerebral Wasting syndrome due to HIV
CD4 Cell** Category	A	B	C			
(1) ≥ 500/mm3	A1	B1	C1			
(2) 200-499/mm3	A2	B2	C2			
(3) < 200/mm3	A3	B3	C3			

* See table for clinical definitions. Shaded area indicates expansion of AIDS surveillance definition. Cat C currently "reportable." Cats A3 and B3 will be "reportable" as AIDS cases.

** There is a diurnal variation in CD4 counts averaging 60/mm³ higher in the afternoon in HIV+ individuals and 500/mm³ in HIV- persons. Blood for sequential CD4 counts should be drawn at about the same time of day each time (*J AIDS 3:144, 1990*). The equivalence between CD4 counts and CD4 % of total lymphocytes is: >500 = ≥ 29%, 200-499 = 14-28%, < 200 = 14%.

[1] Nodes in 2 or more extrainguinal sites, at least 1 cm in diameter for ≥ 3 months

[2] The above must be attributed to HIV infection or have a clinical course or management complicated by HIV.

[3] These are the 1987 CDC case definitions (*MMWR 36:15, 1987*)

and treatment was withheld until counts dropped to below 200 (Hamilton, et al., 1992). This was in contrast to symptomatic patients with counts of 300-500 who were treated early with AZT, among whom only 15% progressed to AIDS. However, the authors noted that early treatment with AZT did not improve survival; in addition, the early treatment group had increased rates of drug side-effects -- 20% had anemia, 5% required transfusion, and 40% had nausea and diarrhea. This study has caused many AIDS experts to question the use of AZT in these patients. However, just two months later, in April, 1992, the Multicenter AIDS Cohort study reported improvements in survival with AZT/PCP treatment (Neil, et al., 1992). In this study, 2-year death rates in patients with CD4+ counts between 200-349 varied from 21% in symptomatic, untreated patients to 3.9% in asymptomatic, treated patients.

- CD4+ Count of 500 or More Without AIDS-Defining Condition: The two-three year prognosis for these patients is generally considered to be very good.

TABLE VII-2
Recent Studies of Survival After Diagnosis of AIDS

Author (year)	Findings
Hamilton, et al. (1992)	76 patients treated with AZT. Median survival time was 18 months.
Vella, et al. (1992)	159 patients treated with AZT. Patients with higher CD4+ counts had a 48% 2-year survival rate compared to 42% for patients with lower counts.
Moore, et al. (1991)	352 patients treated with AZT. Two-year survival was 56% for non-Hispanic whites, 47% for minorities.

(2) Selection of Appropriate Screening Protocols

As discussed above, state law specifically prohibits routine HIV-antibody testing, and probably would be interpreted as prohibiting any inquiries about HIV status per se. However, there are alternative ways to identify candidates who may warrant restriction. Unfortunately, some of these alternatives are quite expensive; others may involve historical inquiries of a personal nature which may seem inappropriate to a personnel analyst or to the hiring agency's legal counsel. The evaluating physician is therefore strongly advised to consult with the hiring agency before using any of these protocols. These will be discussed in order of increasing cost and potential for controversy.

a. No protocol: For a starting point in this discussion, it is appropriate to estimate how many candidates with HIV who warrant restriction would be hired inappropriately by an agency if no screening protocol were used. The answer to this question depends upon numerous factors, such as the location of the agency, and the ethnic/gender composition of the candidate pool. A considerable amount of self-selection away from a career in law enforcement would be expected among persons with certain risk factors, such as IV drug abuse. For example, the City of Los Angeles has hired over 2,000 officers between 1988-1992 without the use of an HIV+ screening protocol. As of the end of 1992, there are no known cases among these new recruits of an officer developing a disability or other problems due to AIDS.

b. Using physical exam results and laboratory tests that would be obtained for the evaluation of other conditions: The routine physical examination and lab testing that is recommended for other conditions would be expected to detect a certain percentage of HIV+ candidates of concern. For example, examination of the mouth may reveal hairy leukoplakia or candidiasis. The CBC may show lymphopenia (note: Fournier & Sosenko (1992) found that CD4+ counts are highly correlated with total lymphocyte counts). Persons with findings suggestive of HIV could be referred to their private doctor to establish diagnosis and prognosis. This protocol has the advantage of freeing the hiring agency from any additional costs or legal problems. The primary disadvantage is that the use of very non-specific tests will commonly result in unnecessary delays in the processing of acceptable candidates.

c. Asking directed questions regarding HIV-related conditions that are job-specific in addition to using routine lab and exam results: The use of specific questions regarding HIV-related conditions (see General Screening Recommendations) could provide information in addition to that gleaned from the routine exam. Persons answering affirmatively would be asked to provide a private evaluation as in protocol (b). This protocol has all of the advantages of protocol (b), but is more specific.

d. Performing CD4+ testing on high risk candidates: High risk candidates would be those who have had a transfusion between 1978 and 1985, skin anergy, a history of IV drug abuse, a history of homosexuality or multiple sex partners. Persons identified under protocols (b) and (c) above would also be given CD4+ tests. Persons with low CD4+ counts would then be referred for a private evaluation of diagnosis and prognosis. This protocol has the advantage of being the most sensitive and the most consistent with good medical practice in the private community. However, disadvantages include cost (CD4+ tests cost about $100-$150) and invasiveness of privacy that may be considered inappropriate in the pre-placement examination setting. Furthermore, the legal tenability of conducting surrogate HIV tests such as CD4+ counts is uncertain.

A final concern of this approach involves the CD4+ test itself. In non-infected persons, levels can fluctuate by as much as 35-75%, depending on the time of day (McCarthy & Fetterhoff, 1989). Although diurnal fluctuation is less in HIV+ patients, a group of patients with an average CD4+ count of 333/mm3 was observed to have a mean fluctuation of 44/mm3 (Malone, et al., 1990). Acute illness and inter-laboratory differences may also contribute to fluctuations by as much as 100-200/mm3 (Steinberg & Cunningham-Rundles, 1989). Given these considerations, decisions based on CD4+ counts should rely on averages rather than individual measurements or extreme values.

(3) **Need for Ongoing Evaluation of HIV+ Candidates After Hire**

Periodic re-evaluation of HIV+ candidates after hire can identify those who develop conditions that may have an impact on job performance. As mentioned earlier, most of these individuals will become impaired within 10 years (Rutherford, et al., 1990). Additionally, frequent skin testing to assess TB seroconversion and anergy is very important for persons assigned to jails. Persons who develop anergy cannot be assessed by TB skin testing and should be restricted from jail work. For these reasons, a hiring agency may wish to consider having all HIV+ candidates sign a pre-placement agreement consenting to periodic re-evaluation.

b. RECOMMENDED EVALUATION PROTOCOL:

Screening protocols that involve either questions or tests directed at identifying HIV+ candidates must be discussed with the hiring agency.

If the physician already knows that a candidate is HIV+, efforts should be made to obtain all relevant information regarding how and when the infection was acquired, symptoms, treatment, and complications (note: a history of IV drug use is also relevant to the candidate's background investigation). Knowledge of past CD4+ levels are very helpful. If the candidate has experience with AZT or other drugs, the physician should ask about side-effects. The physician must obtain a signed release that specifically authorizes the review of past records related to the HIV infection. As mentioned above, generic medical release forms are not adequate. A current CD4+ lymphocyte count should be required.

Any restrictions of candidates with HIV infection should be based on one or both of the following:

1. CURRENT INABILITY TO PERFORM PATROL OFFICER DUTIES

This evaluation is based primarily on a history of functional problems, exercise and occupational history, and/or a current exercise test. The candidate should be able to demonstrate an aerobic capacity of at least 42 ml/O2/kg (see Respiratory chapter). Inability to perform could be due to either constitutional symptoms, opportunistic infections, or side-effects of medication. Restrictions should be activity specific.

2. IT IS PROBABLE (I.E., >50%) THAT THE CANDIDATE WILL BECOME UNABLE TO REGULARLY PERFORM ESSENTIAL DUTIES IN THE IMMEDIATE FUTURE (I.E., 2-3 YEARS)

GROUP I: CD4+ COUNT AVERAGING 500 OR MORE

These candidates are likely to be able to perform patrol officer duties for longer than 2-3 years.

GROUP II: CD4+ COUNT AVERAGING 200-500 WITHOUT AIDS-DEFINING CONDITION

These candidates should be evaluated by an infectious disease specialist to determine prognosis based on the most recent developments in the field. However, in general, a poor prognosis would be indicated by a history of clinical category B conditions (see Table VII-1), or a CD4 count which has dropped by 50-100% in the last 12-18 months.

GROUP III: CD4+ COUNT AVERAGING <200, OR AIDS-DEFINING CONDITION

The hiring agency should be advised that it is probable that the candidate will be unable to perform the essential duties of a patrol officer within the next 2-3 years.

2) CHRONIC VIRAL HEPATITIS

a. GENERAL CONSIDERATIONS:

Many aspects of chronic hepatitis that have an impact on the ability to perform essential duties, as well as on evaluation and prognosis, are discussed in the Gastrointestinal chapter. It is assumed that the physician has reviewed that chapter (as well as, if necessary, a standard textbook of internal medicine). This section focuses on whether the potential transmission of the B or C hepatitis virus to a suspect would justify placing restrictions on prospective patrol officers. To make this determination, the physician should consider the annual risk of a suspect becoming infected, whether such an infection would constitute a direct threat, and whether there are methods of reasonable accommodation that could significantly reduce the risk of substantial harm to a suspect.

1. ANNUAL RISK OF A SUSPECT BECOMING INFECTED

This risk is determined by the following two factors:

- The probability of a suspect being parenterally exposed to the blood of a given patrol officer per year.

  As discussed earlier (see HIV section), this risk has been estimated to be at the most, 1-6% annually.

- The probability of infection per exposure episode.

  This risk depends on a number of factors, such as the amount of the inoculum, whether the exposure occurs to an open wound or a mucosal membrane, and the infectivity of the patrol officer. When estimating infectivity, consider the following:

  Hepatitis B: In persons who are surface antigen positive (HBsAg+), infectivity varies greatly depending on the titer of the "e" antigen (HBeAg). High titers of this antigen (in the absence of "e" antibodies) indicates active viral replication and a high concentration of viral particles in the serum. The risk of transmission based on needle-stick and perinatal studies after exposure to these high-risk persons appears to be about 80% (Table VII-3). Of course, many persons with chronic hepatitis B do not have high HBeAg titers; others commonly develop anti-e antibodies (Liaw, et al., 1982; Norkrans, et al., 1982) indicating clearance of free viral particles from the serum.

  Hepatitis C: Since HCV assays have only recently been developed, infectivity studies are limited. Kiyosawa, et al. (1991) found seroconversion in only 3.7% of 110 persons who had documented needle-stick exposures to the blood of patients with antibodies to HCV. However, by using more sensitive antibody and RNA tests (which are not yet commercially available), Mitsui, et al. (1992) documented seroconversion in 10% of 68 persons following needlestick accidents.

Multiplying estimates of the annual risk of suspect exposure per officer by those for the risk of infection per exposure yields an estimated annual risk for a suspect becoming infected with either hepatitis B or C per infected officer (Table VII-4 - column 2).

TABLE VII-3
Risk of Hepatitis B Infection After Exposure to HBeAg+/HBeAb- Blood Without Post-Exposure Prophylaxis*

Author (year)	Findings
Alter, et al. (1976)	78% of 18 developed hepatitis after needle-stick accident
Beasley, et al. (1977)	85% of 20 mothers transmitted hepatitis perinatally to their babies
Tada, et al. (1982)	76% of 21 mothers transmitted hepatitis perinatally to their babies

*HBeAg measured by immunodiffusion

2. RISK OF SUBSTANTIAL HARM

Acutely, most infections result in either asymptomatic or mild self-limiting illness. Substantial harm will be defined as either:

- Acute infection severe enough to require hospitalization; or
- Chronic infection since this entails risk of disability, death, hepatic cancer, or transmission to others.

Hepatitis B: Acutely, severe disease requiring hospitalization occurs in about 5% of all cases (DOL, 1989). An additional 5% of acute cases will result in chronic disease consisting of either an asymptomatic (but infectious) chronic infection, chronic persistent hepatitis, chronic active hepatitis, cirrhosis, or hepatic cancer (Junge & Deinhardt, 1985). This results in a total risk of substantial harm of 10% per infection. [Note: These two groups can be added together since they are mutually exclusive in virtually all cases. It is rare for survivors of severe acute hepatitis to develop chronic infection (Karvountsis, et al., 1974)].

Hepatitis C: Acutely, HCV infection is usually not severe and hospitalization rates are unknown. However, chronic infection develops in at least 50% of those infected (Dienstag, 1983).

In Table VII-4, the annual risk of a suspect contracting hepatitis (column 2) is multiplied by the above probabilities that a given infection will result in substantial harm. The resulting estimates of the annual risk of substantial harm to a suspect range from a maximum of 1/200 per officer who is HBeAg+, to 1/300 per officer who is HCV+ (column 3).

TABLE VII-4
Assessment of the Maximal Annual Risk of Substantial Harm to a Suspect Due to the Employment of an Applicant Who is a Chronic HBV or HCV Carrier

Sero-status of the patrol officer	Annual risk of a suspect contracting hepatitis	Annual risk of substantial harm to a suspect	Residual annual risk of substantial harm if suspect is treated		
			HBIG only	HBIG+ vaccine	ISG
HBeAg+*	0.8 - 4.8%	0.08 - 0.48%	0.02% - 0.12%	0.002% - 0.034%	
HCV+	0.1 - 0.6%	0.05 - 0.30%			<0.05 - 0.30%

*Risks would be substantially lower if the officer is either HBeAg- or has Anti-HBe.

3. REASONABLE ACCOMMODATION

The risk of substantial harm to a suspect can be reduced by having an effective post-exposure program.

The risk of contracting HBV from a high-risk donor (HBeAg+) can be reduced to 24-28% if HBIG is administered within seven days of exposure (Table VII-5). Standard protocols recommend a second dose 4 weeks after the first, but one dose appears to be equally efficacious (at least in the small study by Masuko, et al., 1985). Initiating the HBV vaccine series (10-20 mg of yeast-derived recombinant antigen given I.M. at 0, 1, and 6 months) at the time of the first HBIG dose can further decrease the risk of contracting HBV. This regimen has been shown to have an effectiveness of about 93-96% in perinatal studies of HBeAg+ mothers (Stevens, et al., 1987; Wong, et al., 1984; Beasley, et al., 1983). In the only needle-stick study involving HBeAg+ donors, Mitsui, et al. (1989) observed subsequent infection in only 1 of the 31 patients who were administered HBIG and the vaccine. The one case of hepatitis was in a person who could not tolerate the third dose of the vaccine and who did not develop anti-HBs antibody. Together, these studies suggest that the risk of infection after exposure to HBeAg+ blood can be reduced to 3-7% by using HBIG and vaccine.

Thus, it appears that administration of either HBIG alone or with the vaccine could significantly reduce the risk of substantial harm to an exposed suspect. An HBIG program would reduce a suspect's maximum annual risk of substantial harm to 1/800 per infected officer (Table VII-4, column 4). Administering vaccine with HBIG could further reduce maximal risk to 1/3,000 (Table VII-4, column 5).

TABLE VII-5
Rate of HBV Infection Following HBIG Post-Exposure Prophylaxis*

DONOR HbeAg+	Number of Persons Exposed	Number Infected After HBIG (%)
Grady, et al. (1978)	131	32 (24%)
Hoofnagle, et al. (1979)	74	21 (28%)
Masuko, et al. (1985)	37	10 (27%)

*HBIG was given within 7 days and repeated after 4 weeks in all studies except for Masuko, et al. (1985) which did not give a second dose. HBeAg was measured by immunodiffusion in all studies.

After exposure to HCV, immune serum globulin (ISG) can be administered, although the effectiveness of this is unknown. However, any effectiveness would reduce the maximal annual risk of substantial harm to a suspect to less than 1/300 per infected officer.

Establishing a post-exposure program for suspects should not cause undue hardship on a police department. Such programs should have already been established for police officers in order to comply with Cal-OSHA regulations. When body fluids are exchanged between officers and suspects, officers often have their own blood tested for baseline purposes. If HBsAg and HCV tests were included in this baseline, the results could be used to guide the proper prophylactic treatment of the suspect. Thus, post-exposure assessment could simply become another standard protocol in the delivery of care to incarcerated suspects.

In conclusion, it would be difficult to justify restricting the activities of a patrol officer candidate based upon what appears to be a very low risk to others after reasonable accommodation.

b. RECOMMENDED EVALUATION PROTOCOL:

The physician should review the protocol suggested in the Gastrointestinal chapter. If the candidate is found acceptable using that criteria, the risk of substantial harm to others would appear to be too low to warrant restrictions. Ideally, the agency should have protocols for evaluating exposed arrestees that includes routine antigen testing of the "donor" officer. This would obviate the need to disclose the antigen status of a candidate to the agency.

3) TUBERCULOSIS

Candidates with a history of tuberculosis, a positive chest radiograph, or a positive skin test are relatively easy to evaluate.

- History of TB: The primary concern here is whether adequate treatment was given and whether there is any residual lung damage. The latter can be evaluated by spirometry and an exercise test, if necessary. A history of adequate treatment should include either 6 months of a three-drug regimen, or 9 months of a two-drug regimen. Furthermore, there should be documentation of sputum conversion and a stable chest radiograph.

- Positive Chest Radiograph: A radiograph suggestive of active TB would require evaluation by the candidate's private physician. Candidates with active pulmonary TB should be deferred until certified as non-infectious.

- Positive Skin Test: About 4% of US citizens are skin-test positive. Assuming the chest radiograph is negative and there is no history of recent night sweats or weight loss, these candidates are at a very low risk of developing active TB in the near future. However, prophylactic treatment with INH is indicated in many cases. Reference should be made to published guidelines from the California TB Control Program. Use of INH will not interfere with patrol officer duties since the primary side effect is reversible liver inflammation.

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MUSCULOSKELETAL SYSTEM[1]

I. INTRODUCTION

A. OUTLINE OF HIGHLIGHTED CONDITIONS

Neck:	1) Cervical Pain, Radiculopathy, and Instability
Back:	2) Lumbar Pain, Radiculopathy, and Disc Surgery
	3) Spondylolisthesis
	4) Scoliosis
	5) Miscellaneous Back Abnormalities
Knee:	6) Meniscus Injuries
	7) Loose Body in the Knee
	8) Patellofemoral Problems
	9) Anterior Cruciate Ligament Instability
	10) Collateral Ligament Instability
Upper Extremity:	11) Acromioclavicular Separation
	12) Shoulder Subluxation and Dislocation
	13) Finger Amputations/Arthrosis
Miscellaneous:	14) Retained Hardware
	15) Leg Length Discrepancy

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[1]Author: R. Leonard Goldberg, M.D.
Specialist Review Panel:
Neck/Back - Stanley Bigos, M.D.; Vert Mooney, M.D.; James Stark, M.D.
Knee - Dale Daniel, M.D.; James Garrick, M.D.; James Stark, M.D.
Upper Extremities/Misc. - David Levine, M.D.; Phillip Sobol, M.D.

B. IMPLICATIONS FOR JOB PERFORMANCE

Abnormalities in the musculoskeletal system may limit an officer's ability to perform numerous essential tasks such as:

- Running in pursuit of suspects for distances up to 500 yards. Speed is important in up to 90% of incidents.

- Balancing and walking several yards at 6-10 feet above ground on top of walls or other surfaces which are frequently only 6" wide.

- Climbing 6' fences, 2-5 flights of stairs, 20' ladders, and 36' embankments where speed is required 33% of the time.

- Jumping/hurdling/vaulting across 3-5' ditches, down from 6' walls, and over 3' shrubs. Speed is required 90% of the time. One-third of these events occur from a stationary position.

- Moving incapacitated persons without assistance for distances averaging 40'. Speed is critical in 40% of instances.

- Pushing vehicles, dragging and pulling objects averaging 60 lbs. without assistance where speed is required 50% of the time.

- Crawling/crouching/squatting

- Subduing combative subjects

- Firearm and weapon handling which includes the ability to use batons, resist take-away attempts by suspects, and to maintain stability of the arm and wrist despite recoil forces of up to 48 lbs. (shotguns).

II. MEDICAL EXAMINATION AND EVALUATION GUIDELINES

A. GENERAL SCREENING RECOMMENDATIONS

1) History: The physician should obtain the following information for each incidence of musculoskeletal injury:

- Circumstances of the Injury: How did the injury occur, and did it result in a personal injury or workers' compensation award? The physician must try to assess the contribution of litigation to protracted treatment periods or disability.

- Dates of Injury, First Symptom, First Treatment, Last Symptom, Last Treatment, Last Evaluation: When injuries result in litigation, these dates are often very different and can yield important clues as to the true severity of the injury. For example, it is not uncommon for whiplash victims to have symptoms which begin 1-2 days after the accident as muscle spasm and inflammation develop. Symptoms that develop immediately may indicate a more severe injury. Those that develop at one week or more may have resulted from a visit to a lawyer's office rather than from the accident. The date of first treatment may also provide similar clues. The physician should ask for the date of last symptom and the date of last treatment in separate questions. The candidate must explain any discrepancy of more than 2-3 weeks. It is not uncommon, especially in personal injury cases, for candidates to report that treatment lasted for months after they became asymptomatic. Medical record review will usually reveal that the candidate reported symptoms for the length of treatment. Unless the candidate resolves this discrepancy to the satisfaction of the examiner, more credibility should be placed on the written medical records.

  The hiring agency should be informed if the candidate admits falsifying information to a previous health care provider in an attempt to defraud an insurance company or former employer. This information may have relevance in the agency's background investigation of the candidate.

  Finally, the physician should ask the candidate if there have been any evaluations subsequent to the termination of treatment. These may have been performed as part of either a permanent disability determination or a pre-placement evaluation by another agency.

- Extent of Disability: What was the impact of the injury or pain on the candidate? Were there limitations in sitting, standing, lifting, or walking? How many days of work were lost? How long were work restrictions necessary? Did the candidate return to the same work duties? Did the candidate work despite the presence of pain? Was the candidate awarded permanent disability? What was the impact of the injury on the candidate's participation

in sports? Are there any current symptoms or residual impairment of functional ability?

- Problems Since Recovery: Have there been any recurrences of pain or other problems since the recovery period?

2) Examination: A thorough musculoskeletal examination on every candidate, regardless of history, would be quite time-consuming. Alternatively, an adequate screening exam for candidates with a negative history could consist of the following components:

   - Inspection of all joints for scars or obvious atrophy.

   - Upper Extremity: Range of motion, apprehension test for shoulder instability, and grip strength.

   - Back: Heel/toe walk, forward flexion, inspection, palpation, and passive straight leg raise.

   - Knees: Duck walk and squat (note any difficulty or asymmetry), inspection (note any scars, atrophy of the medial vastus obliquus muscle, or effusion), measure bilateral thigh circumference at 10 cm. proximal to the patella with active straight leg raising (note differences >1/2"), test for anterior cruciate and collateral ligamentous laxity at 30 degrees of flexion, screen for patellar apprehension, and have the candidate perform a one-legged hop bilaterally (normal symmetry is +/-15%). More detail regarding these tests are provided in the recommended evaluation protocols for the knee conditions, or by reviewing Henning, et al. (1986).

3) Routine Testing: No routine testing of the musculoskeletal system is recommended for candidates who have a negative history (this includes physical ability testing and x-ray examination). However, the physician should be aware that POST requires that all patrol officer recruits successfully complete a physical work sample test before graduation from a certified academy.

B. EVALUATION OF COMMON CLINICAL SYNDROMES

1) CERVICAL PAIN, RADICULOPATHY, AND INSTABILITY

a. GENERAL CONSIDERATIONS:

Certain soft-tissue and bony abnormalities of the cervical spine can result in sudden neurological compromise of the extremities if the neck is jarred or forced into hyperextension or flexion. If this occurs during a critical incident, the safety of the officer and the public could be in jeopardy. Consequently, the physician must attempt to identify those candidates who pose a significantly increased risk. This can be a difficult task, given the following statistics:

- 35% of the population has a history of neck pain and 10% have had neck pain associated with arm pain (Wiesel, 1989);
- 85% of all neck injuries are due to a motor vehicle accident and many result in litigation (Wiesel, 1989);
- Among those who deny a history of neck pain, 35% of 40-45 year-olds and 75% of 50-55 year-olds will have radiographic evidence of degenerative changes (Gore, et al., 1986);
- MRI will show evidence of either a herniated or bulging disc in 10% of persons who deny a history of neck pain (Boden, et al., 1990a).

In summary, neck complaints are common, their duration is often biased by non-physical factors, and poor specificity limits the usefulness of radiographic information.

Given these considerations, guidelines for recommending restrictions must be based on criteria with the highest possible specificity. Although not an exhaustive list, these criteria include any of the following:

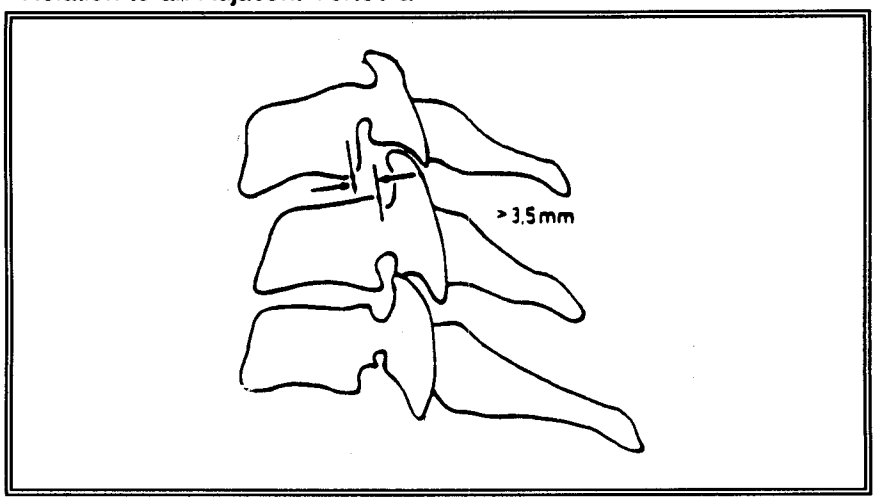
- Current EMG Evidence of Neuropathy: The EMG provides the most specific evidence that cervical pathology has clinical significance. A minority of these candidates may have demonstrable impairment, such as loss of grip strength. In others, it is reasonable to assume that cervical stress during a critical incident (for example, due to sudden forced flexion/extension) could exacerbate the neuropathy, and result in acute impairment. EMG findings of concern would include the observation of more than one positive sharp wave or fibrillation potential, or a significant H-reflex delay.
- Current Limitation of Activity: Many patients find that heavy lifting or other activities significantly aggravate their neck pain (Wiesel, 1989). Such limitations are likely to interfere with the candidate's ability to perform patrol officer duties.

- Current Cervical Instability: In the normal cervical spine, horizontal displacement between vertebrae does not exceed 3.5 mm (Figure VIII-1) and angular differences do not exceed 11 degrees (Figure VIII-2) even when measured at extremes of flexion and extension (White, et al., 1975). Stability can be disrupted by cervical fractures or severe disruption of the posterior ligaments. It is generally recognized that instability creates a substantial risk of catastrophic neurological compromise if sudden stress is placed on the neck (as could occur when subduing a combative arrestee). Therefore, candidates with abnormal instability should be referred for surgical arthrodesis (Micheli, 1985). Fusion of the cervical spine is not considered a contraindication to neck trauma if the segments above and below the level of fusion are mechanically stable (Micheli, 1985).

- History of Cervical Laminectomy without Fusion: Even if performed with minimal exposure, destabilization of the spine significantly increases the risk of catastrophe with neck trauma (Micheli, 1985).

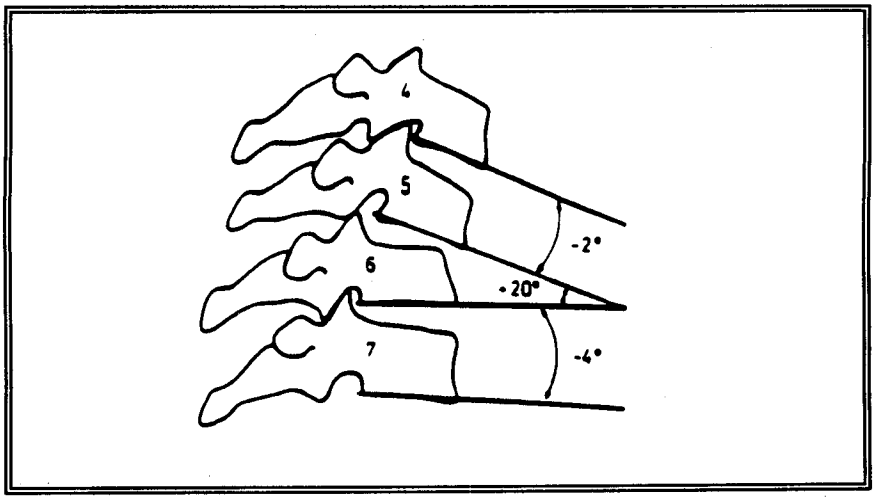
- History of Temporary Traumatic Para or Quadriplegia: Despite subsequent solid arthrodesis and restoration of neurologic function, most surgeons would restrict activities involving neck trauma in these candidates (Micheli, 1985).

FIGURE VIII-1
Horizontal Displacement Greater than 3.5 mm of One Vertebra in Relation to an Adjacent Vertebra



Reproduced with permission from White A.A., et al. 1975. Biomechanical analysis of clinical stability in the cervical spine. Clin Orthop Rel Res. 109:85-96.

FIGURE VIII-2
Rotational Difference Between Adjacent Vertebra



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b. RECOMMENDED EVALUATION PROTOCOL:

For the purposes of this protocol, the history must be sufficiently thorough to establish the extent to which the candidate has experienced periods of:

- Isolated Neck Pain With No Apparent Functional Significance: Candidates deny any limitation or restriction in work, daily activities, or sports.

- Radicular Symptoms: Defined as symptoms or signs in the arm distal to the shoulder. These are suggestive but not diagnostic of neural compromise.

- Limitation of Activities: May be secondary to either impairment, avoidance, or restriction. The physician must keep in mind that assessing activity levels in the post-morbid state is always biased by the pre-morbid activity level. For example, it is much more likely that an active candidate will report a history of activity limitation, compared to a sedentary candidate.

Medical record review is highly recommended to confirm the candidate's history, especially when litigation was involved. The results of any previous diagnostic test, such as an MRI, CT, or EMG should be obtained.

The physician should perform a thorough neck examination which includes range of motion, palpation, and neurological screening for evidence of radiculopathy. Range of motion should be performed with the neck in neutral position and full extension.

GROUP I: NO HISTORY OF FRACTURE/DISLOCATION AT ANY TIME, AND NO LIMITATIONS OR RADICULAR SYMPTOMS IN THE LAST THREE YEARS

No restrictions or further evaluation (including radiographs) can be justified unless the physical exam detects abnormalities.

GROUP II: NOT MEETING CRITERIA FOR GROUP I

Obtain lateral flexion/extension and bilateral oblique radiographs. Consider ordering an EMG in the following circumstances:

- Limitations that lasted for 3 months or more, or
- Radicular symptoms that lasted for 1 month or more, or
- Radiographic evidence of neural compression, such as marked narrowing of foramen on the oblique radiograph or displacement of neural elements observed on MRI or CT scan, or
- Physical exam results suggesting current neuropathy.

Any of the following major findings would indicate that restrictions against subduing arrestees are justified to reduce a direct threat to either the candidate or others:

- Most recent EMG is consistent with a neuropathy due to cervical pathology;
- Current neck or arm complaints involving limitations of activity;
- Current cervical instability on the basis of flexion and extension radiographs;
- History of cervical laminectomy without fusion;
- History of temporary/traumatic para or quadriplegia.

In general, chronic non-limiting cervical pain that is EMG-negative is not considered sufficiently dangerous to warrant work restrictions. However, for the pain to be considered non-limiting, the candidate should be currently participating in activities that are equivalent in intensity to that required of patrol officers.

In certain cases of very recent neck pain, temporary deferral (never to exceed three months) may be justified by the need to determine the course of the condition and to allow complete healing of stretched ligaments. The severity and duration of the pain and the candidate's current activity level should be major determinants of the length of the deferral period.

2) LUMBAR PAIN, RADICULOPATHY, AND DISC SURGERY

a. GENERAL CONSIDERATIONS:

Many of the considerations discussed above for the cervical spine apply to the evaluation of the lumbar spine. This evaluation focuses primarily on assessing the risk of sudden incapacitation during a critical incident involving such lumbar-stressing activities as carrying an unconscious person, pushing a 3,000 lb. car, jumping down from a 6 foot wall, or subduing an arrestee. Certain candidates are at substantially increased risk of acute neurological compromise of a leg (Weber, 1990), or more commonly, an incapacitating acute spasm of the lumbar musculature.

An additional consideration with regard to lumbar spine injuries is the frequent occurrence of chronic disability that often develops after a patrol officer incurs an on-duty back injury. The only study available found that 9/42 (21%) of back-injured patrol officers remain on restricted duty for three months or longer (Sullivan, 1991). Whether due to the nature of patrol officer duties, or the availability of generous compensation, this rate of chronic disability appears to be much greater than the 5% reported for the general population (Anderson, et al., 1983). For many agencies, accommodating a three-month or greater period of disability may represent undue hardship, as well as interfere with protecting public safety.

Similar to those with cervical problems, the identification of candidates who are either at significantly increased risk of sudden incapacitation or who have a >50% probability of developing chronic disability is difficult due to the following considerations:

- Back pain is a part of life: 60-90% of the population will experience low back pain at one time or another (Kelsey & Golden, 1988), and 40% will have sciatica at some point in time (Frymoyer, et al., 1983);

- A specific anatomical diagnosis is made in only 12-15% of cases (Rowe, 1969);

- Despite the risk of chronic disability, as cited above, a back injury in a patrol officer typically results in less than two weeks of restricted duty. In fact, the median time off is only 4 days (Sullivan, 1991);

- Radiographic surveys of patients >40 years old who deny a history of back pain have found prevalence rates of degenerative changes as high as 50% (Magora & Schwartz, 1976);

- MRI and CT scanning will show disc herniations in about 20% of patients who have no history of back pain (Boden, et al., 1990b; Wiesel, 1984).

Given these considerations, guidelines for recommending restrictions or deferral periods must be based on criteria with the highest specificity possible.

To prevent sudden incapacitation during a critical incident, the following criteria are suggested for assigning restrictions to candidates with < Grade III spondylolisthesis or <45 degree scoliosis (see later sections for evaluation of these specific conditions):

- Current EMG Evidence of Neuropathy: The EMG provides the most specific evidence that lumbar pathology has current clinical significance. A minority of these candidates may have demonstrable impairment, such as leg weakness. In others, it is reasonable to assume that stress to the back during a critical incident could exacerbate the neuropathy and result in acute impairment. EMG findings of concern would include the observation of greater than one positive sharp wave or fibrillation potential, or a significant H-reflex delay.

- Current Limitation of Activity: Many patients find that heavy lifting, prolonged sitting, or other activities significantly aggravate their lumbar pain. Such limitations are likely to interfere with the candidate's ability to perform patrol officer duties.

- History of Multi-Level Laminectomy Without Fusion: This procedure greatly disturbs the mechanics of the spine and indicates markedly abnormal underlying connective tissue disease.

A separate set of criteria was developed to identify candidates who should be temporarily deferred due to a high risk (>50% chance) of chronic disability within the immediate future (0-3 years). "Chronic disability" was defined as restricted duty for at least a 3-month period. This definition was based not only on the undue hardship considerations mentioned above, but also on the observation that these patients have a 25% probability of never returning to unrestricted work (Waddell, 1990).

Numerous studies have examined the predictive value of a multitude of risk factors, such as previous back pain, age, back weakness, poor cardiovascular fitness, smoking, and severe multiple disc degeneration (see Bigos, et al., 1990

for summary). Making reliable conclusions from the literature is difficult due to differences in outcome parameters and poor control of confounders, such as occupational and recreational activity levels. Additionally, many risk factors, such as muscle weakness and prior back injury, are highly intercorrelated (Nordgren, et al., 1980). With this in mind, the following criteria are recommended as the basis for deferring certain candidates:

- Recent Episode of Back Pain that Resulted in at Least Three Months of Activity Limitation: Several studies have shown that the recurrence rate for back pain is about 50-60% within the first year (Bergquist-Ullman & Larsson, 1977; Troup, et al., 1981; Biering-Sorensen, 1984). Although these studies looked at the recurrence rate of any back pain (rather than specifically chronic pain or activity-limiting pain), it is not unreasonable to assume that a history of chronic limiting pain creates a 50-60% probability of recurrence of a pain of similar severity and duration. Using this assumption, these candidates should be restricted from high-risk activities, such as very heavy lifting, pushing, pulling, and wrestling, until they have been asymptomatic for at least 12 months following an episode of chronic limiting back pain.

- Recent Lumbar Disc Surgery: Although there are numerous types of surgeries for herniated discs, all are associated with substantial risks of recurrent or chronic pain and disability. In a review of 2,500 surgeries, Taylor (1989) found that 40% of patients did not achieve complete pain relief. In a review of 19 studies, Spangfort (1972) found that an average of 23% of patients were not able to return to their original level of employment. However, in the vast majority of cases, recurrent pain will occur within the first post-surgical year (Weber, 1983).

  When post-surgical patients do return to work, their risk of serious injury is substantially increased. Based on a small prospective study of postal workers, Ryan and Zwerling (1990) found that the back injury rate of new employees who had recent back surgery was six times higher than normal. Additionally, a back injury in this population resulted in either repeat surgery or retirement in 50% of eight cases. The median lost time was 66 days, compared to 8.5 days for back injuries in other employees. These considerations would strongly support deferral of post-surgical candidates until they have resumed intensive occupational or recreational activities, without limitations, for at least 6-12 months.

b. RECOMMENDED EVALUATION PROTOCOL:

The history must be sufficiently thorough to establish the extent to which the candidate has experienced periods of:

- Isolated Lumbar Pain With No Apparent Functional Significance: Candidates deny any limitation or restriction in work, daily activities, or sports.

- Radicular Symptoms: Defined as symptoms or signs in the leg distal to the buttocks. These are suggestive but not diagnostic of neural compromise.

- Limitation of Activities: May be secondary to either impairment, avoidance, or restriction. The physician must keep in mind that assessing activity levels in the post-morbid state is always biased by the pre-morbid activity level. For example, it is much more likely that an active candidate will report a history of activity limitation compared to a sedentary candidate.

Medical record review to confirm the candidate's history is highly recommended, especially when litigation was involved. The results of any previous diagnostic test, such as an MRI, CT, or EMG, should be obtained.

Candidates with a history of low back pain should have a complete back examination which includes the tests described under General Screening Recommendations plus range of motion, measurement of leg lengths (see Leg Length Discrepancy), and a complete neurological examination of the lower extremities.

GROUP I: NO HISTORY OF LUMBAR DISC SURGERY, LIMITATIONS, OR RADICULAR SYMPTOMS IN THE LAST THREE YEARS

No restrictions or further evaluation (including radiographs) can be justified unless the physical exam detects abnormalities.

GROUP II: NOT MEETING CRITERIA FOR GROUP I

Obtain straight lateral and bilateral oblique radiographs if there is a history of chronic or recurrent pain in the last three years. If prior radiographs exist, an attempt should be made to obtain and use them, since a spine series involves a significant amount of radiation.

Consider ordering an EMG in the following circumstances:

- Limitations that lasted for 3 months or more, or

- Radicular symptoms that lasted for 1 month or more, or

- Radiographic evidence of neural compression, such as marked narrowing of foramen on the oblique radiograph or displacement of neural elements observed on MRI or CT scan, or

- Physical exam results suggesting current neuropathy.

Any of the following major findings would indicate that restrictions against heavy lifting, jumping, and subduing combative arrestees are justified:

- Most recent EMG is consistent with a neuropathy due to lumbar pathology;

- Current symptoms which limit activity;

- History of multi-level laminectomy without fusion.

In general, chronic non-limiting lumbar pain which is EMG-negative is not considered sufficiently dangerous to warrant restrictions. However, for the pain to be considered non-limiting, the candidate should be currently participating in activities/sports that are equivalent in intensity to that required of patrol officers.

Temporary deferral (never to exceed 12 months) may be justified in cases of:

- Recent episode of back pain that resulted in at least 3 months of activity limitation;

- Recent lumbar disc surgery.

3) SPONDYLOLISTHESIS

a. GENERAL CONSIDERATIONS:

Spondylolisthesis is the most common cause of back pain in adolescence and is usually due to stress lysis (spondylolysis) of the posterior arch at L5. If anterior slippage of L5 occurs, it is graded as follows:

Grade I - 25% or less
Grade II - 26-49%
Grade III - 50-75%
Grade IV - >75%

Slippage generally does not progress significantly after skeletal maturity, except occasionally in cases of high-grade (Lonstein, 1987b) or L4 slips (Saraste, 1987).

Typically, the primary symptom is constant back pain which is aggravated by carrying heavy loads or taking long walks. Radicular symptoms may occur with more severe slips due to stretching of nerve roots over the posterior sacral body. Disc prolapses are rare because the posterior ligament is drawn taut and prevents posterior bulging (Wiltse, 1971). Severe slips may cause a back deformity manifested by increased lordosis and harnstring tightness (Akbarnia & Keepler, 1989).

Spondylolysis and Grade I or II spondylolisthesis do not appear to be major risk factors for lumbar disability (Semon & Spengler, 1981; McCarroll, et al., 1986; Apel, et al., 1989; Friberg, 1987). However, despite a paucity of literature, there is a general consensus that slips of 50% or more have an exceedingly poor prognosis. In fact, some experts advocate surgery on adolescents with Grade III slips even if asymptomatic (Lonstein, 1987b). In one of the larger studies of high-grade slips, Harris and Weinstein (1987) followed eleven Grade III and IV patients for 18 years. Only four patients were asymptomatic; the others either had symptoms, muscle atrophy, hyporeflexia, or avoided heavy lifting.

The degree of slippage is usually assessed with a standard lateral radiograph. Instability demonstrable on routine flexion/extension views does not correlate with symptoms and does not contribute significant information (Pearcy & Shepherd, 1985; Stokes & Frymoyer, 1987; Saraste, 1987).

b. RECOMMENDED EVALUATION PROTOCOL:

When there is a history of spondylolisthesis, the physician should perform a complete back examination which includes the tests described under General Screening Recommendations, plus range of motion, as well as a complete neurological examination of the lower extremities. A recent cone-down lateral radiograph must be obtained in order to use the protocol below.

GROUP I SPONDYLOLISTHESIS <50%

This does not represent a significant risk factor. Evaluate as per the recommended evaluation protocol in "Lumbar Pain, Radiculopathy, and Disc Surgery."

GROUP II SPONDYLOLISTHESIS 50% OR MORE

In most cases, these candidates should be restricted from heavy lifting and wrestling to prevent chronic pain (Watkins & Dillin, 1990). However, the physician should consider making exceptions in rare cases of candidates in their late twenties or thirties who have a documented record of heavy exertion over a number of years without significant back pain or radiculopathy. These candidates should also not have tight hamstrings, limited spinal motion, obesity, weak abdominal muscles, or neurological findings on exam.

4) SCOLIOSIS

a. GENERAL CONSIDERATIONS:

Scoliosis is of concern due to the potential for chronic pain, radicular symptoms, and restriction of lung volumes.

Scoliosis often causes activity-related aching and fatigue due to muscle pain, facet joint arthrosis, or degenerative disc disease (Lonstein, 1987a). A major determinant of the amount of pain is the degree of the curve. As a group, patients with curves <45 degrees do not have an increased incidence of pain (Kostuik & Bentivoglio, 1981; Winter, 1987). With larger curves, most will have some pain. In a cross-sectional study of a non-patient population, Kostuik and Bentivoglio (1981) found that 7/8 scoliotics with curves of 45 degrees or more had pain. Three individuals had pain of moderate severity that resulted in occasional lost time at work and regular use of analgesics. Two other individuals were disabled from severe pain. This study also found that, in general, scoliotics in physically demanding jobs were less able to cope, missed more time from work, and were more likely to be incapacitated.

The location of the curve is also important. Pain is rare in scoliosis limited to the thorax compared to lumbar or thoracolumbar curves (Lonstein, 1987a).

Approximately 2% of scoliotics have radicular symptoms due to nerve root entrapment from facet joint hypertrophy and/or vertebral spur encroachment into the foramen (Kostuik, 1980). However, facet joint sclerosis on radiograph does not generally result in a significant increase in the probability of pain (Kostuik & Bentivoglio, 1981). Cord compression is not a complication of idiopathic scoliosis (Lonstein, 1987a).

Cardiopulmonary symptoms due to chest wall deformity can occur, especially in scoliotics with curves >40 degrees (Ascani, et al., 1986).

Curve progression is discussed extensively in the literature, since curves that are progressing tend to be more painful, and progression may be an indication for surgery in patients < age 35, even if they are asymptomatic (Kostuik, 1990). However, after skeletal maturity, curves <30 degrees generally do not progress, and those that are larger progress very slowly on average. Thoracic curves >50 degrees progress an average of 1 degree/year, while others progress an even lesser amount (Weinstein & Ponseti, 1983; Ascani, et al., 1986). Due to the difficulty of accurately measuring angles, a diagnosis of curve progression requires a change of at least 10 degrees.

Scoliosis may be treated by means of bone grafting or internal fixation devices. These procedures will usually decrease and stabilize the curve (Edgar & Mehta, 1981). The risk for continued lumbar pain, acute injury, secondary upper thoracic

and cervical pain, and functional difficulties with stressful activities depends on the number of non-mobile segments and the location of the fusion. Fusions of 2-3 segments are not associated with an increased risk of acute injuries, but pursuit of vigorous activities will cause long-term deterioration due to increased mechanical stress immediately above or below the fused portions of the spine. However, most spinal surgeons would strongly advise patients with fusions of 4 segments or more to avoid heavy contact sports, such as rugby or football, due to an elevated risk of acute injury (Micheli, 1985).

Many studies have found that the distal extent of the fusion is a major risk factor for residual lumbar pain (Edgar & Mehta, 1981). Cochran, et al. (1983) reported pain in approximately 20% of patients with fusion ending at L2, 40% at L3, 60% at L4, and 80% at L5. Several studies have found that the incidence of pain is higher in the presence of degenerative changes (Edgar & Mehta, 1981; Kostuik, et al., 1973).

Extensive fusions, such as those associated with Harrington rods, can also cause functional difficulties. Dickson, et al. (1990) found that 45% of patients treated with rods had at least some difficulty with sitting, sports, carrying, and lifting.

b. RECOMMENDED EVALUATION PROTOCOL:

In candidates with a history of scoliosis, the physician should specifically inquire about any signs of curve progression, such as decreasing height or increasing dorsal hump on flexion. A thorough exercise history involving both recreational and occupation stressors to the back is very important.

A complete back examination should be performed which includes the tests described under General Screening Recommendations, plus range of motion, as well as a complete neurological examination of the lower extremities. Spirograms should be performed on all candidates, especially those with curves of 45 degrees or greater. Spirogram evaluation guidelines are found in the Respiratory Chapter.

Medical record review is strongly recommended. Previous back radiographs are useful if assessment of progression is important. The best view to assess curve angles is a full-length (3 feet) spinal x-ray. Details regarding measurement of scoliosis can be found in Morrissy (1990).

GROUP I: CURVE <45 DEGREES

Evaluate per guidelines in "Lumbar Pain, Radiculopathy, and Disc Surgery."

GROUP II: CURVE ≥45 DEGREES

Level 1: No history of radiculopathy at any time and no limitation of recreational or occupational activities in the last year

If age <35 and there has been significant curve progression after adolescence (i.e. >10 degrees), the candidate may require surgery and should therefore be deferred until seen by an orthopedist. However, the probability of progression is not high enough to warrant deferral during a prospective observation period.

Candidates should be deferred if they are not currently stressing their backs at a level equivalent to that required by patrol officers since most will develop moderate-to-severe pain with these activities. Those who can demonstrate that they can tolerate heavy activities with no more than mild discomfort do not warrant deferral or restriction.

Level 2: Does not meet criteria for Level 1

These candidates should be restricted from heavy lifting and wrestling since they are either at increased risk of sudden incapacitation from nerve root traction and/or are likely to become disabled from patrol officer activities.

GROUP III: HISTORY OF SURGERY

Candidates with a history of spinal fusion should have a flexion-extension radiograph to evaluate the fusion, and a CT to examine neural elements and the patency of the canal (Micheli, 1985). In questionable cases, an EMG may be necessary.

Level 1: Less than 4 segments fused

Candidates who have either:

- Residual positive neurological signs or symptoms;
- Unstable fusions;
- Compression of neural elements documented by EMG; or
- Loss of 30% of the neural canal

are probably at substantial risk of serious injury from patrol officer activities. In all cases, a deferral for at least 12 months post-op is necessary to ensure complete healing (Micheli, 1985).

Level 2: Fusion of 4 segments or more

In addition to the factors identified in Level 1, the physician should consider the following risk factors:

- Extension of the fusion to L3 or below,
- Radiographic evidence of degenerative changes above or below the fusion,
- Secondary cervico-thoracic pain, or
- An activity level not equivalent to patrol officer duties.

A candidate with any of these risk factors can develop frequent and limiting pain with heavy lifting, pushing, pulling, and wrestling, and should therefore be restricted.

5) MISCELLANEOUS BACK ABNORMALITIES

There are numerous lumbar spine abnormalities, often discovered on routine radiographs, which have no prognostic value and, generally, should be ignored:

- Tropism, or misorientation of the facet joints;
- Increased lumbar lordosis (Hult, 1954; Splittoff, 1953; Horal, 1969);
- Lumbosacral tilt (Horal, 1969; Hult, 1954);
- Spina bifida occulta (Wiltse, 1971);
- Transitional vertebrae (Wiltse, 1971);
- Schmorl's nodes.

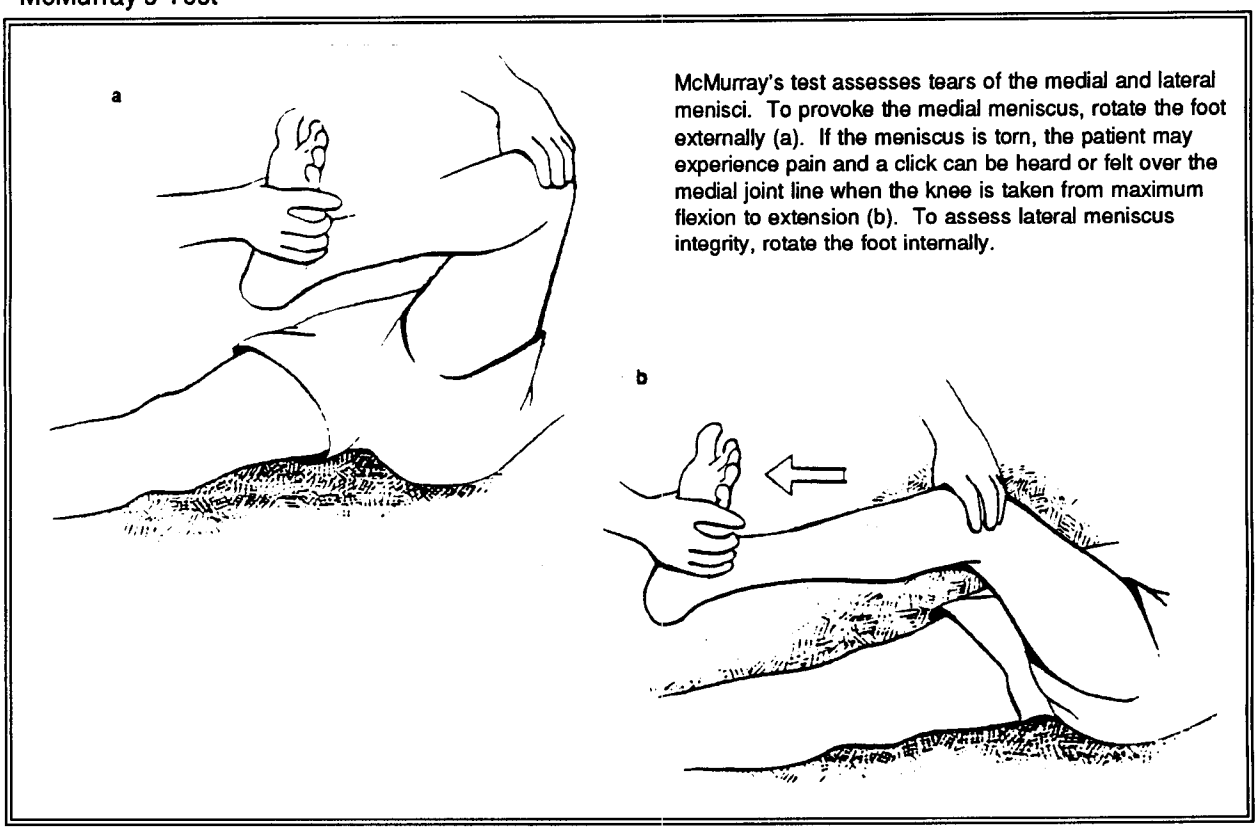
6) MENISCUS INJURIES

a. GENERAL CONSIDERATIONS:

A torn meniscus typically causes the knee to suddenly lock. Secondary pain may also cause the knee to suddenly give way (Henning, et al., 1986). If either occurs during a critical incident, the safety of the officer and the public could be jeopardized. Consequently, in most cases, the presence of a torn meniscus would clearly require a work restriction. Exceptions may be made in candidates >40 years old who may have tears secondary to degenerative changes rather than trauma. These generally do not cause locking.

The diagnosis is suspected if there is a history of locking, giving way, or joint line pain. On examination, classic findings include joint line tenderness and a positive McMurray's sign (Figure VIII-3). The diagnosis is confirmed with either an MRI scan, arthrogram, or arthroscopy.

FIGURE VIII-3
McMurray's Test



McMurray's test assesses tears of the medial and lateral menisci. To provoke the medial meniscus, rotate the foot externally (a). If the meniscus is torn, the patient may experience pain and a click can be heard or felt over the medial joint line when the knee is taken from maximum flexion to extension (b). To assess lateral meniscus integrity, rotate the foot internally.

Berg, E., Henderson, J.M. and Simon, R.R. 1990. Office diagnosis of knee pain. Patient Care. 24:48-78. Reproduced with permission from Patient Care, September 30, 1990. Copyright (c) Medical Economics Publishing, Montvale, NJ.

The MRI scan has been shown to be very accurate for diagnosing meniscal tears. Radiologists generally grade the tear on a scale of I-III. Grade I represents intrameniscal signal changes without tear. A grade II change represents a linear intrameniscal signal not extending to the superior or inferior meniscal surface. On arthroscopy, approximately 17% of these menisci will be found to be torn (Fischer, et al., 1991). If a high-powered 1.5 tesla magnet is used, a grade III tear will be confirmed by arthroscopy in 80-90% of cases (Fischer, et al., 1991; Polly, et al., 1988; Wirth, et al., 1990).

The MRI has limited usefulness in two groups of patients: (1) older individuals; and (2) those who complain of recurrent symptoms after repair of a tear. In older patients, the clinical significance of observed changes is uncertain, since degeneration has been found to occur naturally with age. In those who have undergone meniscal repair, the MRI cannot accurately differentiate between old scarring and a recurrent tear. The MRI does not become "normal" even in successful patients. Consequently, these patients must be evaluated with either an arthrogram or arthroscopy.

Depending on the extent and location, a meniscal tear can be managed either non-operatively, with surgical repair, or by removal (partial or complete). Conservation of as much of the meniscus as possible is the goal, since total removal leads to later problems in most patients. For example, in a study of 180 Navy officers, Veth (1985) found that, after 5 years, 72% had at least one of the complaints shown in Table VIII-1. Forty percent of the officers had at least two of the complaints numbered 6-14. Jorgensen, et al. (1987), who studied 131 athletes, found that 53% were symptomatic and 10% had instability after five years. After an additional ten years, 67% were symptomatic, 36% had instability, and 89% had radiographic degenerative changes. As a consequence, 46% had given up or reduced their sporting activity, and 6.5% had changed their occupation. A poor outcome was likely if the patient had at least one complaint in addition to radiographic changes when examined at five years post meniscectomy.

In the immediate post-surgical period, physical therapy is very important to ensure muscle rehabilitation. Most surgeons do not allow agility drills, squatting, or full-speed running until after three months following excision and six months following repair (DeHaven & Sebastianelli, 1990; Henning, 1990).

TABLE VIII-1
Post-Operative Complaints in Patients Who Are Treated by Meniscectomy

1. Stiffness of knee
2. Swelling of knee
3. Pain at rest and/or motion
4. Feeling of instability
5. Loss of strength associated with knee movements
6. Giving way
7. Normal participation in sports and/or hobbies impossible
8. Disability climbing/descending stairs
9. Disability kneeling
10. Disability squatting
11. Disability walking on uneven surfaces
12. Inability to perform the same occupation as preoperation
13. Change of occupation due to post-meniscectomy symptoms
14. Locking

From Veth, R.P.H. 1985. Clinical significance of knee joint changes after meniscectomy. Clin Orthop Rel Res. 198:56-60. Reprinted by permission of the publisher.

b. RECOMMENDED EVALUATION PROTOCOL:

For the candidate who reports a history of meniscal tear, the physician should inquire regarding any of typical complaints found in Table VIII-1. Details regarding any surgical treatment and subsequent rehabilitation should be noted.

In addition to the knee exam described in General Screening Recommendations, the candidate should be given a complete examination of both knees which includes the following:

- Range of Motion: With the patient supine and knees flexed, note any differences in heel to thigh distances. With the patient prone, knees fully extended and feet hanging beyond the table, note any differences in heel height. In both measurements, a centimeter difference represents a 1 degree loss of range of motion. A significant deficit is considered to be present when the knee cannot be flexed to at least 120 degrees, or there is an extension deficit of 10 degrees or greater (Mohtadi, et al., 1991).

- McMurray's Test: See Figure VIII-3.

An AP and lateral radiograph is useful in establishing the extent of degenerative changes. The AP film should be obtained in the standing position if possible.

Record review is generally not necessary unless there is evidence of cruciate ligament (AP) laxity or a history of post-recovery symptoms.

In general, a candidate with normal examination results should be considered acceptable after resuming vigorous activity for at least a three-month period without significant symptoms. This recommendation is made regardless of the original pathology or treatment. However, in questionable cases in which activity or symptomatic status is in doubt, it is appropriate to give some consideration to objective prognostic factors, such as the extent of meniscus excision, the amount of time since the tear occurred (prognosis worsens with time elapsed), and the presence of degenerative changes on radiograph.

Evidence of significant muscle atrophy, muscle weakness, or loss of motion warrants a referral to a physical therapist for further assessment and possible rehabilitation. Either abnormality can limit peak performance during a critical incident and substantially increase the risk of patellofemoral pain (see Patellofemoral Problems).

Candidates with a positive McMurray's should be re-evaluated by an orthopedist and have an arthrogram or arthroscopy if there is any doubt regarding the current status of the meniscus.

7) LOOSE BODY IN THE KNEE

A cartilaginous or bony fragment can cause sudden locking or giving way due to pain. If either occurs during a critical incident, the officer's and the public's safety could be jeopardized. The risk of locking is considered to be significant if there is a prior history of locking or if the loose body is >5 mm in size.

In the candidate population, loose bodies are most commonly discovered on knee radiographs as incidental findings. With the initial set of films, it is often difficult to determine whether the object is adherent to other structures and, therefore, not of concern. Repeat radiographs after walking are very helpful and should show movement of the object if it is a true loose body.

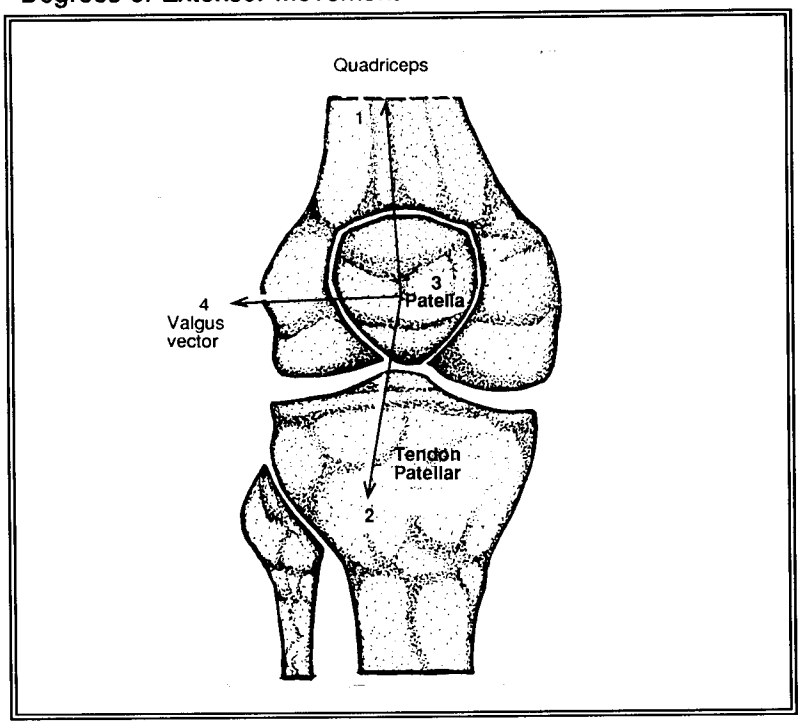
If a loose body is confirmed, the candidate should be restricted from running and wrestling until it is removed. Exceptions could be granted if prior radiographs document that the loose body has been present for a number of years and the candidate has been asymptomatic.

8) PATELLOFEMORAL PROBLEMS

a. GENERAL CONSIDERATIONS:

The patella and the patellar ligament transmit the extension force of the quadriceps to the proximal tibia. The normal medial "bowing" or valgus of the leg creates a "Q" angle between the quadriceps ligament above and the patellar ligament below the patella (Figure VIII-4). This results in a force vector which pulls the patella laterally.

FIGURE VIII-4
The Q Angle Imposes a Lateral Vector on the Terminal Degrees of Extensor Movement



Reproduced with permission from Fulkerson, J.P., and Hungerford, D.S. eds. 1990. Disorders of the Patellofermoral Joint. 2nd ed. Baltimore: Williams & Wilkins.

In the normal knee, this lateral force is opposed by a combination of static and active stabilizers. The static stabilizers consist primarily of the medial peripatellar retinaculum and the femoral groove or trochlea between the femoral condyles. The primary active stabilizer is the medial component of the quadriceps, the vastus medialis obliquus (VMO).

Normal patellar tracking can be summarized as follows: At full extension, the patella is slightly proximal and lateral to the trochlear groove. Between 0-20 degrees of flexion, the patella is smoothly and gradually drawn into the groove and is well-seated by 30 degrees. The dynamics of this movement require a perfect balance between the lateral force vector and the medial stabilizers.

When this balance is disturbed, excessive lateral tilt and/or movement of the patella can cause excessive pressure on the lateral patellofemoral joint surfaces, lateral subluxation of the patella, and in extreme cases, dislocation. The resultant abnormal forces result in the eventual destruction of the joint cartilage (chondromalacia) and reactive/degenerative changes in the affected bones (arthrosis).

Clinically, patients complain of anterior knee pain, especially when the knee is loaded on hills or stairs. The pain is thought to be due primarily to abnormal stretching of the peripatellar ligaments (Fulkerson & Hungerford, 1990). Subluxation commonly causes sensations of giving way and may cause a patient to stop activity, at least temporarily (Eisele, 1991). Actions that typically precede subluxation include decelerating while walking downstairs, running, jumping, or twisting while putting weight on the affected leg. Subluxation can lead to frank dislocation at any time, even with trivial injuries (Fulkerson & Hungerford, 1990). Dislocation is a dramatic and severe injury which always causes at least temporary incapacitation.

On examination, patients will often show "apprehension" when the examiner presses laterally on the patella with the knee flexed at 30 degrees. There may be obvious atrophy in the VMO or less firmness on contraction compared to the opposite side.

With the development of severe chondromalacia and arthrosis, patients may also complain that prolonged sitting with the knees flexed (as in a theater or car) causes pain, and pseudo-locking or a gelling sensation on attempting to straighten the knee under load (Garrick, 1989). With severe arthrosis, sensations of giving way are commonly caused by sudden reflex relaxation of the quadriceps due to severe pain. This may occasionally lead to a fall. Sometimes patients complain of "catching," thought to be due to irregular joint surfaces (Fulkerson & Hungerford, 1990).

In considering a candidate with a history of chondromalacia, keep in mind that:

- The diagnosis of chondromalacia is commonly given to any young athlete with activity-related anterior knee pain based on history alone. This is often erroneous, as the diagnosis requires arthroscopic or MRI visualization of the chondral surface. Pain is more commonly due to malalignment and retinacular stretching.

- There are numerous rating systems for chondromalacia. The most widely used is that proposed by Outerbridge (1961):

  Grade I - softening and swelling
  Grade II - fragmentation and fissuring <1/2" in diameter
  Grade III - fragmentation and fissuring >1/2" in diameter
  Grade IV - erosion of cartilage to bone

- Chondromalacia does not directly cause pain since cartilage is not innervated. Numerous studies have shown a poor correlation between the degree of chondromalacia and pain. However, as the chondral "shock absorber" is worn away, abnormal stress to the innervated subchondral bone will cause pain. Goodfellow, et al. (1976) has stated that surface changes do not cause patellofemoral pain unless bone is exposed in an area of habitual patellofemoral contact.

Patellofemoral malalignment and secondary pain/instability can be caused by any factor that increases the lateral force vector on the patella or weakens the medial stabilizers. Examples include: a high riding patella (patella alta), hypoplastic femoral groove, increased "Q" angle between the femur and tibia due to excessive leg valgus or foot pronation, a high insertion angle of the VMO, or weakness of this muscle. However, the most common cause is thought to be excessive tightness of the lateral peripatellar retinaculum.

Ideally, conservative treatment should attempt to correct the specific underlying cause of the malalignment. More commonly, most physicians generically recommend temporary reduction in activities, VMO strengthening, NSAIDS, and use of a knee sleeve to reduce any lateral tracking. The majority of cases do not require surgery. When surgery is necessary, the most common procedure involves cutting the lateral retinaculum (lateral release).

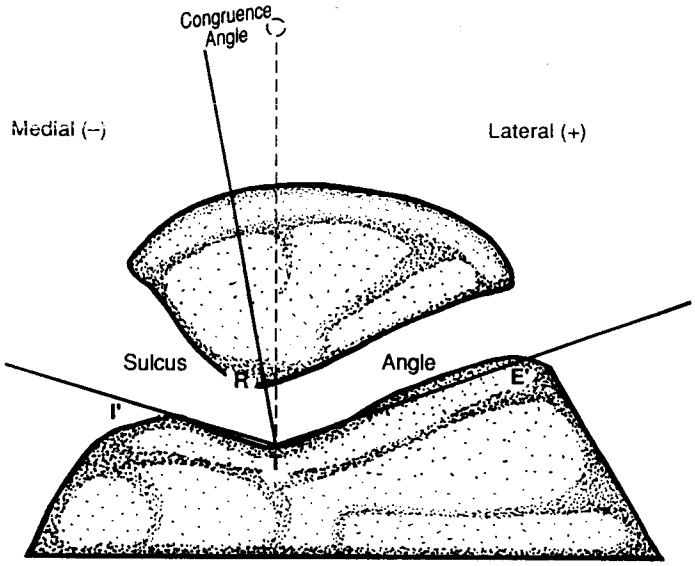
After initially observing that this procedure was frequently unsuccessful, numerous studies were conducted to improve patient selection and outcome. The results have shown that patients will generally have a good to excellent outcome if they (a) have documented tightness of the retinaculum before surgery (Gecha & Torg, 1990; Kolowich, et al., 1990), and (b) undergo sufficient post-op rehabilitation to eliminate radiographically documented lateral patellar tilt and excessive lateral position (Dzioba, 1990; Simpson & Barrett, 1984; Scuderi, et al., 1988).

Dzioba's study clearly documented that rehabilitation was critical for a successful outcome. Radiographs of all patients at 10 days post-op showed no improvement. However, after six weeks of therapy, 44 patients had normal tilt and position; 9 others were abnormal. Three to four years later, 42/44 in the successful rehab group were rated good to excellent. In the other group, all nine patients were still significantly limited in activity and had considerable pain with squatting, kneeling, or prolonged stair climbing. Three of these patients required further surgery.

The radiographic view used in the Dzioba study and many others is a 45 degree patellar axial view originally described by Merchant, et al. (1974). Patellar position is quantified by measurement of the "congruence angle" (Figure VIII-5) between a line that bisects the femoral sulcus angle (line TO) and a line from the bottom of the patella to the lowest point in the femoral groove. Merchant found that normal congruence is -6 degrees, with 95% of normals having an angle of <+16 degrees. Patellar tilt can be evaluated by measurement of the lateral patellofemoral angle

of Laurin, et al. (1984; Figure VIII-6). This angle should be open laterally. Laurin recommended that this angle be measured at 20 degrees, but this is technically very difficult. The 45 degree axial view is a good screening test, but is subject to errors due to projectional angles and overlapping shadows. Moreover, many patients with malalignment may have normal position at 45 degrees, but maltracking at 10-30 degrees (Schutzer, 1986a).

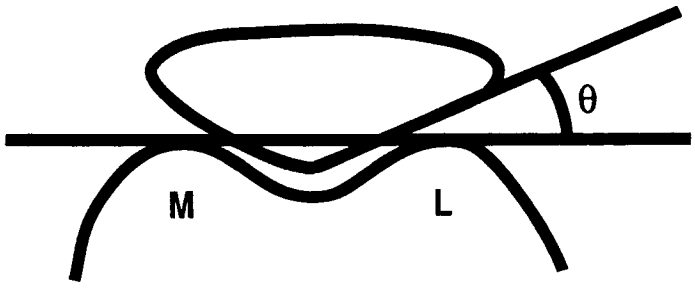
FIGURE VIII-5
Measurement of Congruence Angle



Normal congruence angle = (-) 6 degrees. Ninety-five percent of normals have angles < (+) 16 degrees.

TO, Neutral Reference Line Bisecting Angle E'TI'. RT, Line Connecting Median Ridge to Trochlear Depth. Adapted with permission from Merchant, A.C., et al. 1974. Roentgenographic analysis of patellofemoral congruence. J Bone Jt Surg. 56A:1391-1396.

FIGURE VIII-6
Lateral Patellofemoral Angle



The lateral patellofemoral angle (θ) of Laurin should open laterally (L). This measurement is helpful in screening patients for patellar tilt.

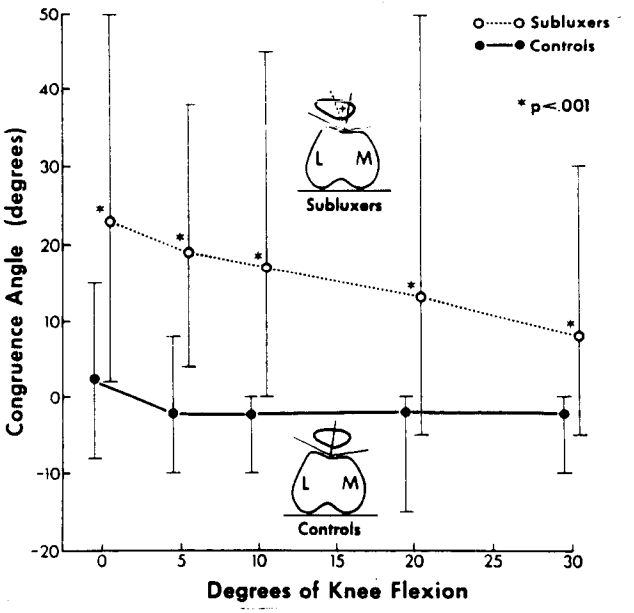
Reproduced with permission from Fulkerson, J.P., and Hungerford, D.S. eds. 1990. Disorders of the Patellofemoral Joint. 2nd ed. Baltimore: Williams & Wilkins.

Patellar CT has been proposed as the optimal method for evaluating the patello-femoral joint because axial images can be obtained during the initial degrees of knee flexion. Typically, scans are made at 0, 15, 30, 45, and 60 degrees at a cost not much greater than ordinary knee radiographs. Normal alignment is defined as a congruence angle of 0 or negative at 15 degrees of flexion (Schutzer, 1986b). Figure VIII-7 indicates expected congruence throughout the range of motion. CT is also much better than ordinary films for measurement of the tilt angle. This angle should always be >7 degrees, and generally has been 12-14 degrees or more at 15-20 degrees of knee flexion in asymptomatic control knees (Schutzer, 1986b).

MRI scanning is useful for examining the extent of chondromalacia. Recently, kinematic MRI scanning has been used to dynamically measure patellar tracking. Compared to CT, this offers the advantage of revealing excessive medial subluxation that is common in post lateral release patients (Shellock, et al., 1989). However, the clinical significance of this has not been established.

It should be noted that the use of knee sleeves to reduce lateral tracking is problematic for patrol officers, since they tend to bunch up and become uncomfortable with prolonged sitting in the patrol car.

FIGURE VIII-7
Patellar CT Measurement of Congruence Angles in Subluxers and Controls



There are many patellofemoral pain patients whose patellae are *relatively* subluxed when compared to controls.

Reproduced with permission from Schutzer, S.F., Ramsby, G.R., Fulkerson, J.P. 1986b. Computed tomographic classification of patellofemoral pain patients. Orthop Clin North Am. 17(2):235-248.

b. RECOMMENDED EVALUATION PROTOCOL:

Candidates with a history of anterior knee pain, patellar subluxation, or patellar dislocation should be carefully questioned regarding the frequency and recency of these symptoms. The physician should specifically inquire about giving way, falling, sensations of instability, and gelling of the knee after prolonged sitting.

The screening knee exam described in the General Screening Recommendations should be augmented to include the following:

- Palpation of the peripatellar retinaculum and soft tissues for tenderness;

- Observation of patellar tracking during active extension of the tibia from 90 to 0 degrees of flexion with the candidate seated.

NOTE: The patellar apprehension sign may stay positive for many years after an episode of instability. Therefore, it cannot be used to indicate a current propensity to dislocate. Its primary usefulness is as a general screening tool for those who deny a history of patellar instability.

All candidates should have 45-degree Merchant axial views of both patellae. The lateral patellar femoral tilt angle of Laurin and Merchant's congruence angle should be measured (see Figures VIII-5 and VIII-6).

All medical records should be obtained and reviewed.

In general, physicians can safely conclude that candidates who meet all of the following guidelines do not warrant further evaluation or work restrictions:

HISTORY:

- Participation at an activity level equivalent to academy training for at least six months with no more than occasional mild pain which did not affect performance or warrant treatment, doctor visits, or use of braces. Any sensation of instability would require further evaluation.

- No subluxation or dislocation for the past two years if conservatively treated, or none for the past year if a lateral release or other realignment procedure was performed.

- No history of documented Grade IV chondromalacia.

EXAMINATION:

- Normal bulk and firmness of VMO
- Normal quadriceps size and function (hop test)
- No tenderness
- Patella smoothly exits from the femoral sulcus at 10-20 degrees of flexion, then moves slightly laterally in the last few degrees of extension. There is no abruptness of patellar movement.

RADIOGRAPH:

- Tilt angle is open laterally.
- Congruence angle at 45 degrees is <+16 degrees.
- Presence of arthrosis is limited to mild degrees of subchondral sclerosis.

Candidates who do not meet these guidelines may be acceptable after a deferral period, or if found to have normal tracking by patellar CT or MRI. In deciding whether to restrict or defer these candidates, the physician should give more consideration to the history, current activity level, and lower extremity function than to radiographic abnormalities, since the clinical specificity of abnormal tilt, congruence angles, and degenerative changes is unknown. The following is presented to assist the physician in typical cases:

- Current or Recent Evidence of Subluxation/Dislocation: This condition substantially increases the risk that the candidate may be suddenly impaired during a critical incident either due to falling, or cessation of activity due to pain or instability. Therefore, these candidates warrant restrictions against field duties.
- Patellar Tilt Without Subluxation: This condition may increase the risk of pain with forced extension during running, stair climbing, and lifting. However, this may not be severe enough to impede an officer during a critical incident. Chronically, it may lead to chondromalacia and arthrosis, but this process takes much longer than two years.
- Grade IV Chondromalacia/Moderate-to-Severe Arthrosis: These conditions increase the risk of pain with forced extension during running, stair climbing, and lifting. Pain and gelling may occur after prolonged sitting in a patrol car. However, this will probably not be severe enough to impede an officer during a critical incident. The best justification for restricting these candidates is the possibility of giving way due to reflex pain. However, this is quite uncommon except in the most severe cases which are characterized by virtual obliteration

of the patellofemoral joint space on radiograph. If this is not present, or if there is no history of giving way, it is difficult to justify restricting candidates who are active and otherwise acceptable.

- VMO or Quadriceps Atrophy: Unless the candidate has an exceptional athletic history, a referral to a physical therapist for further assessment and possible rehabilitation is warranted. As discussed above, muscle weakness increases the risk of patellofemoral pain.

9) ANTERIOR CRUCIATE LIGAMENT INSTABILITY

a. GENERAL CONSIDERATIONS:

Of all the knee ligaments, the anterior cruciate ligament (ACL) is the most important to knee function. Its primary role is to prevent excessive anterior subluxation of the tibia during high stress activities such as pivoting, cutting, and jumping. Without the stabilization of the ACL, the knee is at significantly increased risk of giving way (GW) which could result in sudden incapacitation during critical incidents. The ACL is also important in a wide range of other patrol officer activities, such as walking on uneven ground and squatting (Tables VIII-2-3; Hirshman, et al., 1990).

TABLE VIII-2
Specific Task Performance (Percentage) in ACL-Disrupted Patients, 5 Years Since Injury*

Task	No Problem	Mild Impairment	Moderate Impairment	Unable To Do
Getting out of chair	100	0	0	0
Prolonged standing	76	21	3	0
Walking	94	6	0	0
Walking on uneven ground	65	35	0	0
Ascending stairs	85	15	0	0
Descending stairs	88	12	0	0
Climbing	71	29	0	0
Kneeling or squatting	56	44	0	0
Jogging	71	23	0	6
Running fast	63	19	6	12
Jumping	66	22	3	9
Twisting or pivoting	53	35	3	9
Cutting	50	29	3	18

*Study performed at San Diego Kaiser; N=34. From Hirshman, H.P., et al. 1990. The fate of unoperated knee ligament injuries. Chap. 27 in Knee Ligaments: Structure, Function, Injury and Repair. eds. D.M. Daniel, et al. Reprinted by permission of the publisher.

TABLE VIII-3
Pain, Swelling, and Giving Way in Chronic ACL Patients During Activities of Daily Living

Author	Number of Patients	Pain--More Than Mild or Infrequent	Swelling--More Than Infrequent	Giving Way	Years of Average Follow-Up	Remarks
McDaniel, 1980	49	38%	10%	Not reported for ACL	14	
Noyes, 1983	103	30%	14%	21%	5.5	Selected population of "worst cases"
Hawkins, 1986	40	18%	18%	11%	4	30% who underwent reconstruction not included
Hirshman, 1990	34	0%	0%	9%	5	

From Hirshman, H.P., et al. 1990. The fate of unoperated knee ligament injuries. Chap. 27 in Knee Ligaments: Structure, Function, Injury and Repair. eds. D.M. Daniel, et al. Reprinted by permission of the publisher.

Although many patients return to full athletic activity after an ACL tear, an equal or greater number are unable to do so without significant limitations (Table VIII-4; Hirshman, et al., 1990). Recurrent GW and injury are very common. Sandberg, et al. (1987) observed that 17% will have GW within 13 months after injury. Others have found that 43-88% of these patients will ultimately have trouble with GW (McDaniel & Dameron, 1980; Fetto & Marshall, 1980; Hawkins, et al., 1986; Finsterbush, et al., 1990). Therefore, many orthopedists believe that young athletes who wish to maintain a high competitive ability should have the ligament repaired.

There are five basic approaches to the treatment of a torn ACL -- conservative care and four surgical options. In general, the surgical techniques attempt to create a check-rein, either internally or externally, to limit anterior tibial translocation. *Primary repair* involves direct suturing of the ends of the torn ligament. *External augmentation* attempts to reduce GW by relocating a strip of the iliotibial band to create a lateral "sling" (see Figure VIII-8). *ACL reconstruction* involves using a graft tissue to replace the ruptured ACL. The typical graft source is the central part of the patella tendon or a strip of the semitendinosus or gracilis tendon. The surgeon attempts to position the graft in the anatomical location of the ACL inside the joint (see Figure VIII-9). Recently, some surgeons have advocated a fourth approach which involves the combined use of *external augmentation with ACL reconstruction.*

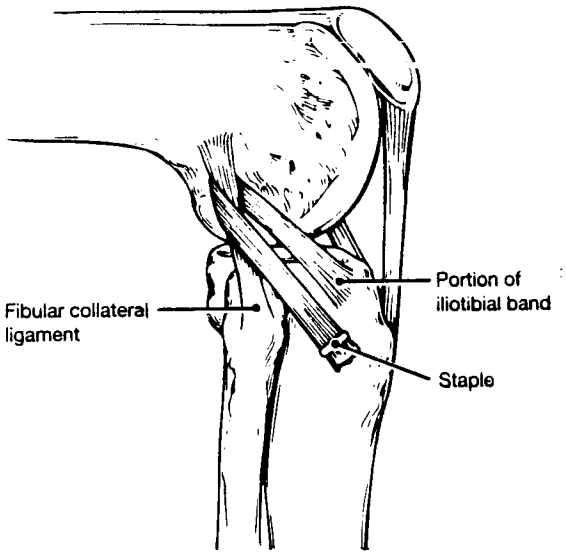
TABLE VIII-4
Sports Activity in Patients with Nonoperative Treatment of Isolated ACL Injuries

Author	Sports Participation	Remarks
Chick, 1978	17% not capable of "full athletic activity"	Excluded patients with moderate or severe anterior instability
McDaniel, 1980	In 58%, the knee restricted or limited sports activity	Little detail on sports functions
Giove, 1983	31% did not return to full preinjury level of participation; 87% had significant signs or symptoms	Patients involved in "heavy participation" sports did less well
Noyes, 1983	35% in strenuous sports, but only 11% without limitation	Only symptomatic patients were included in this study
Walla, 1985	42% in high-intensity sports with limitations; only 14% in same sports at same level	
Satku, 1986	54% did not play preinjury sports	Few details about sports
Fowler, 1987	22% in pivoting sports with activity moderation; 17% uninhibited in pivoting sports	All patients were symptomatic
Hirshman, 1990	47% not playing preinjury sport; only 31% playing without hindrance	

From Hirshman, H.P., et al. 1990. The fate of unoperated knee ligament injuries. Chap. 27 in Knee Ligaments: Structure, Function, Injury and Repair. eds. D.M. Daniel, et al. Reprinted by permission of the publisher.

Although current surgical techniques can reduce the risk of recurrent GW, they do not eliminate it. Furthermore, many patients continue to have problems with swelling, pain, and recurrent injuries. A sample of representative studies are presented in Table VIII-5 to illustrate this point. Of the surgical approaches available, most orthopedists currently believe that primary repair is probably not much better than conservative care. External augmentation does not appear to be very successful either. ACL reconstruction has the best chance for reducing the probability of GW and poor results.

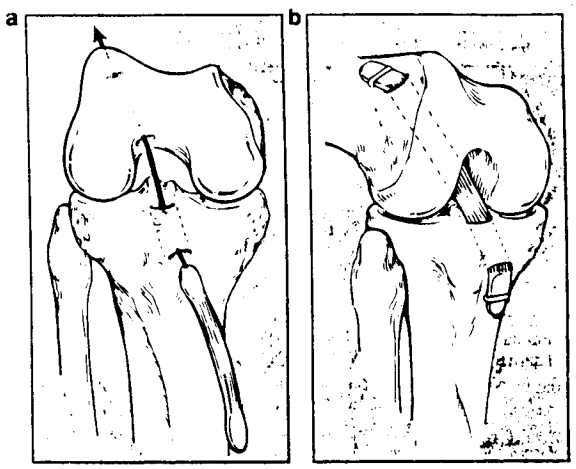
FIGURE VIII-8
Extra-Articular Anterior Cruciate Ligament Reconstruction
Using the Arnold-Coker Iliotibial Band Technique



A strip of iliotibial band is detached proximally and wrapped around the fibular collateral ligament. This procedure can be done with a staple, as shown, or with sutures when a youth's epiphysis is still open.

Reproduced with permission from Nisonson, B. 1991. Anterior cruciate ligament injury. Phy Sports Med. 19(5):82-89.

FIGURE VIII-9
Intra-Articular Reconstruction After Anterior Cruciate Ligament Injury



Repair uses a strip of patellar tendon and its attached bone, shown (a) before placement through drill holes (arrow indicates path) and (b) in its final position.

Reproduced with permission from Nisonson, B. 1991. Anterior cruciate ligament injury. Phy Sports Med. 19(5):82-89.

TABLE VIII-5
Summary of ACL Repair Studies

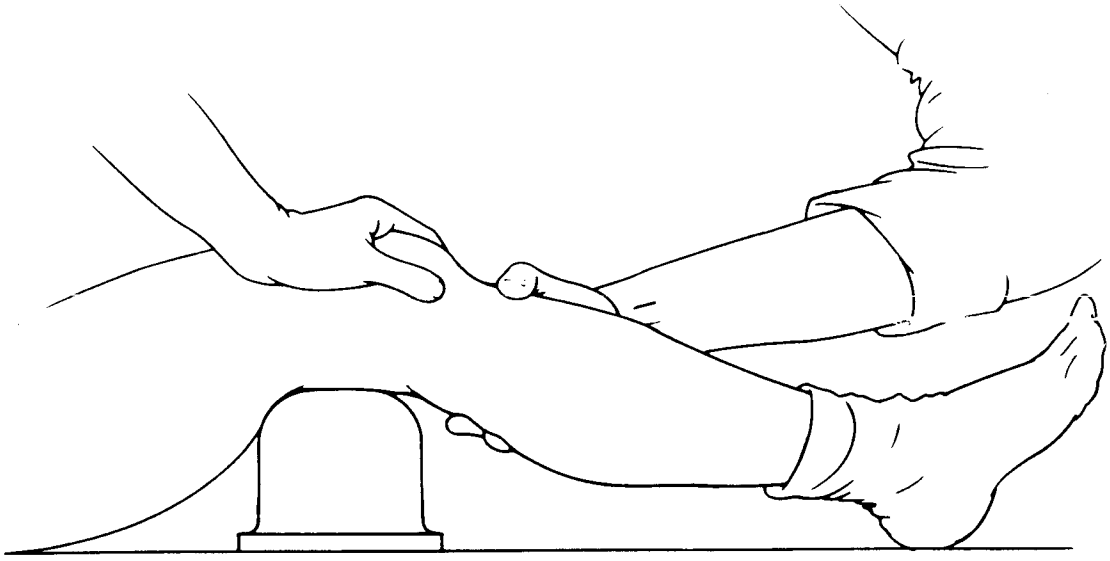
Surgical Technique	Results	Follow-Up period (n)
Primary Repair:		
Feagin 1976	94% instability 55% reinjury rate	5 yr (32)
Kaplan 1990	48% restricted sports 17% failures	7 yr (52)
Sherman 1991	22% fair-poor 18% reinjured	5 yr (50)
Odensten 1984	43% fair-poor	5 yr (35)
Strand 1984	18% had GW	4 yr (60)
External Augmentation:		
Amirant 1988	48% fair-poor	11 yr (27)
Bray 1988	45% unsatisfactory	6 yr (47)
Warren 1978	35% had GW	6.4 yr (17)
Larsen 1991	29% had GW	3 yr (21)
Dahlstedt 1988	67% unsatisfactory	6 yr (39)
ACL Reconstruction:		
O'Brien 1991	5% had GW	4 yr (80)
Johnson 1984	31% fair-poor	8 yr (87)
Noyes 1990	11% fair-poor 2% had GW	3 yr (47)
Shelbourne 1990	6% had instability	4 yr (140)
Noyes 1991	16% had GW	3 yr (64)
Marder 1991	10% had GW	2 yr (80)
Howe 1991	5% had GW 21% unsatisfactory	5.5 yr (83)
ACL Reconstruction Plus External Augmentation:		
Noyes 1991	0% had GW 3% "failure" rate	3 yr (40)
Wilson 1990	0% had GW 7% fair	2-7 yr (32)
O'Brien 1991	No better than reconstruction alone	4 yr (?)
Sgaglione 1990	No better than reconstruction alone	3 yr (51)

Given these considerations, the physician must carefully evaluate all candidates with a history of ACL tear. The typical candidate will deny any current symptoms or functional problems and claim to be athletic. However, despite their apparent subjective success, some of these candidates remain at substantially increased risk of a GW episode in a critical incident, or may have significant functional impairments. The challenge to the physician is to objectively make this determination on an individual basis. To do so requires consideration of the major risk factors for the occurrence of GW and/or functional impairment. These major risk factors include:

1. MORE THAN MINOR INSTABILITY: Instability due to ACL insufficiency is usually quantified in one of four ways. [Note: the injured knee should always be compared to the contralateral normal knee.]

   a) Lachman Test: This is the simplest and most sensitive clinical test for instability (Figure VIII-10). With the extremity in slight external rotation and the knee held in 15-20 degrees of flexion, the femur is stabilized with one hand and firm pressure is applied to the posterior aspect of the proximal tibia, lifting it forward in an attempt to translate it anteriorly. Excessive anterior excursion compared to the opposite knee, or a lack of firm end point are indicative of a positive test. It is customary to report the amount of anterior tibial translation in grades I to IV which increase in 5 mm increments.

FIGURE VIII-10
The Lachman Test



To facilitate patient relaxation, stabilize the femur, and control the joint flexion angle, the patient lies supine with the thigh supported in 20-30° of flexion.

From Dale Daniel, M.D. Reproduced with permission from the author.

b) Anterior Drawer: This classic test, performed with the knee at 90 degrees of flexion, has a sensitivity of only about 33-54% (Zelko & Abrams, 1982; Donaldson, et al., 1985; Jonsson, et al., 1982). Like the Lachman, this test is graded in 5 mm increments.

c) Pivot Shift: Most orthopedists believe this maneuver to be the most specific for GW since it can demonstrate rotatory instability in addition to anterior instability (Figure VIII-11). Traditionally, the finding of rotatory instability indicated a significantly increased risk of GW. However, recent biomechanical studies have discounted the importance of the rotatory component. The major limitations of the pivot shift are its poor sensitivity compared to the Lachman (Donaldson, et al., 1985; Hawkins, et al., 1986), and the technical difficulty involved in performing the test, even for experienced orthopedic surgeons (Noyes, 1991). The pivot shift is usually graded on a three or four point scale: I = mild slipping, II = moderate slipping, and III = clunking, locking or dislocation.

FIGURE VIII-11
Flexion-Rotation Drawer Test (A Method of Demonstrating a Pivot Shift)

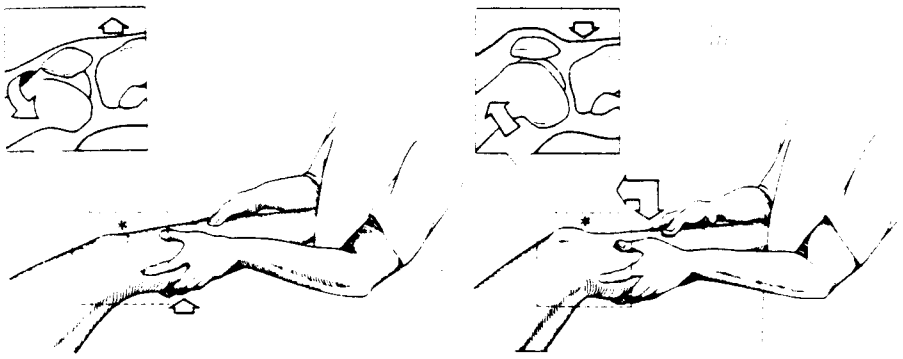


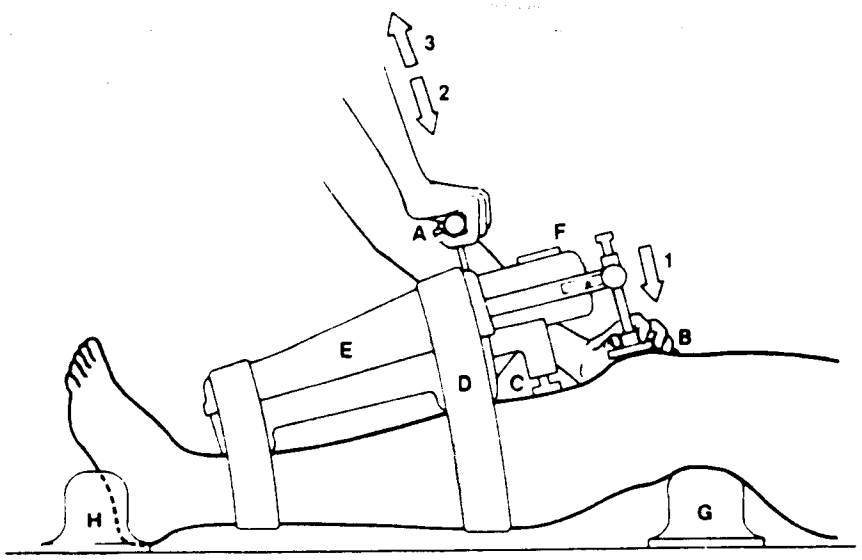
Figure A Figure B

A. Flexion-rotation drawer test, subluxated position. With the leg held in neutral rotation, the weight of the thigh causes the femur to drop posteriorly and rotate externally, producing anterior subluxation of the tibia.
B. Flexion-rotation drawer test, reduced position. Gentle flexion and a downward push on the leg reduces the subluxation. The test is graded: 0 = no shift, 1+ = slight shift, 2+ = moderate shift, and 3+ = momentary locking.

From Noyes, F.R., et al. 1980. Arthroscopy in acute traumatic hemarthrosis of the knee. J Bone Jt Surg. 62A(5):687-695, 757.

d) Arthrometer: Due to the difficulty of performing and quantifying laxity with manual testing, considerable research has been conducted to validate instrumented testing. The most commonly used arthrometer is the KT-1000 (Figure VIII-12). With the knee fixed at 25 degrees of flexion, the device allows the operator to apply a measured amount of anterior force to the tibia. This maneuver is identical to the manual Lachman test, but has the advantage of allowing the examiner to read the amount of displacement from the device. Typically, both knees are tested at 15 lbs., 20 lbs., 30 lbs., and at maximal manual force. Side-to-side differences are computed, as well as the increased displacement between 15 and 20 lbs., or between 20 and 30 lbs. (compliance index).

FIGURE VIII-12
KT-1000 Test



The limbs are supported with a thigh and foot rest (G, H). The arthrometer is placed on the anterior aspect of the leg and held with velcro straps (D). Two sensor pads: one in contact with the patella (B) and the other in contact with the tibial tubercle (C) move freely in the anterior-posterior plane in relation to the arthrometer case (E). The instrument detects the relative motion in millimeters between the two sensor pads and, therefore, motion of the arthrometer case does not affect the measurement which is displayed on the dial (F). Displacement loads are applied through a force sensing handle (A). A tone indicates when a 15 and 20 lb. displacement force is applied. With adequate stabilization of the patella in the femoral trochlea, tibial tubercle motion relative to the patella accurately reflects the motion of the tibia relative to the femur.

Reproduced with permission from Daniel, D.M., and Stone, M.L. 1990. KT-1000 anterior-posterior displacement measurements. Chap. 24 in Knee Ligaments: Structure, Function, Injury, and Repair. eds. D.M. Daniel, et al. New York: Raven Press.

Figure VIII-13 illustrates the expected results in normal vs. ACL-deficient knees (Daniel & Stone, 1990).

The KT-1000 results appear to be fairly accurate and reproducible. Studies using one examiner have found that 90-95% of repeat measurements of both individual knee displacement and side-to-side differences fall within an average range of +/-2 mm (Steiner, et al., 1990; Wroble, et al., 1990; Daniel & Stone, 1990). Different examiners can be expected to produce average group results which differ by about 10-15% (Forster, et al., 1989; Daniel & Stone, 1990).

The KT-1000 arthrometer (produced by MedMetric, San Diego) is not very expensive but does take practice. Many physical therapists perform the test for a relatively low charge.

It is common for candidates with a history of ACL tear to have some degree of demonstrable instability, even if the ligament has been repaired. The difficulty lies in determining the point at which this instability creates a significantly increased risk of sudden incapacitation, or makes it probable that the candidate either has or will develop functional limitations in the near future:

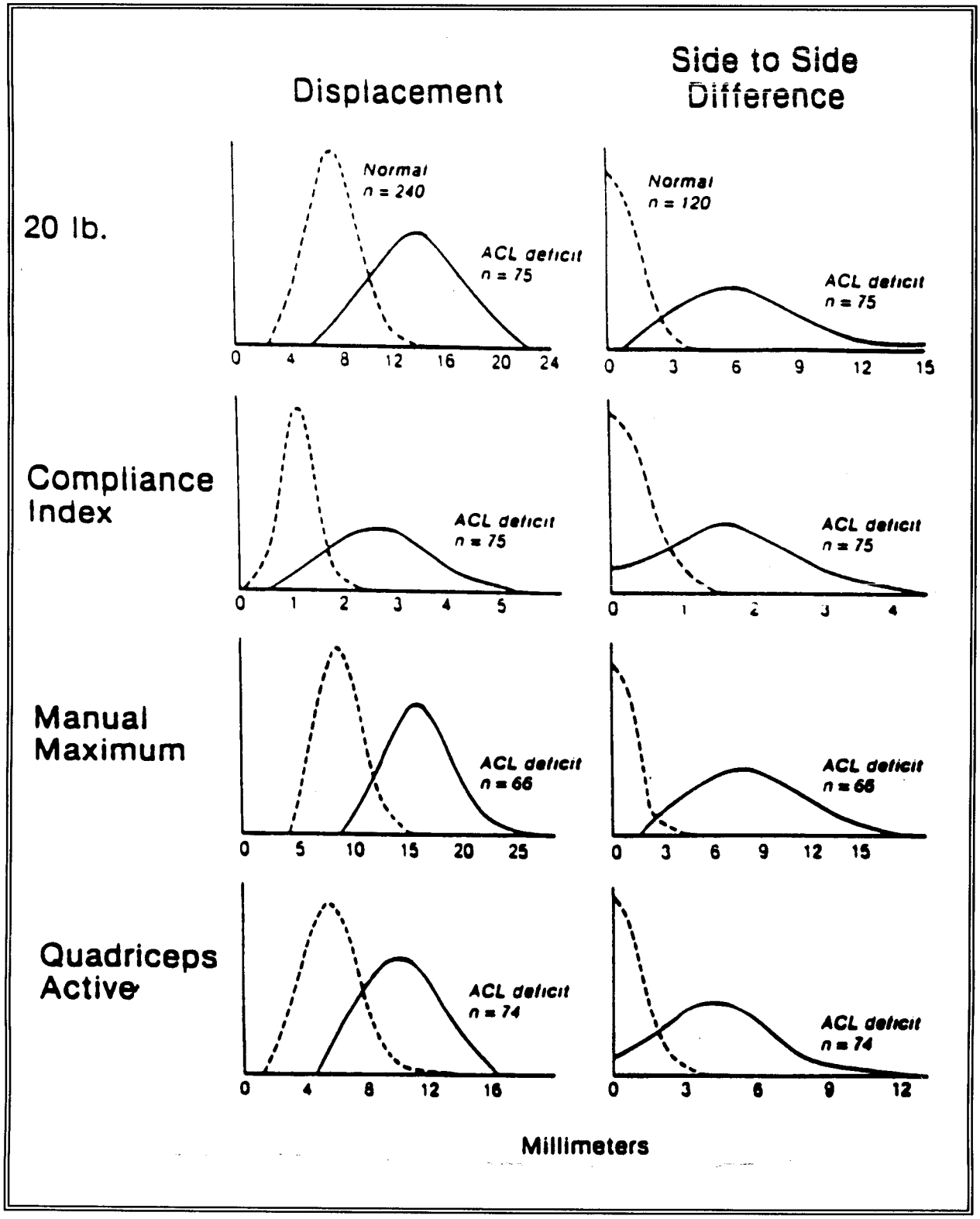
- Lachman Test: There are no studies that correlate the findings on this test with risk of GW.

- Anterior Drawer: One study found that the prevalence of GW was 26% in 11 patients with a 1+ anterior drawer and 73% in 38 patients with >1+ drawer (Warren & Marshall, 1978).

- Pivot Shift (PS): Many orthopedists believe that a positive test is a troubling finding. If the results of four studies are combined, 81% of 94 patients with a (+)PS had problems with GW (McDaniel & Dameron, 1980; Chick & Jackson, 1978; Lysholm, 1982; Strand, et al., 1984). However, based on their clinical experience, it was the opinion of the panel members that the PS should be at least of Grade II magnitude if it is to be used to justify work restrictions.

- Arthrometer: Several studies have found that a side-to-side difference of >5 mm on the KT-1000 test indicates clinically significant instability and poor prognosis. For example, Sherman, et al. (1991) found that 7/10 patients who met this criterion were rated as clinical objective failures within five years of follow-up. The best data regarding clinical significance are found in Daniel and Stone (1990). As part of a long-term follow-up study of 173 consecutive

FIGURE VIII-13
KT-1000 Measurements



Anterior Displacement Measurements for 120 Normal Subjects (240 knees) and for a Group of Patients With a Chronic ACL Disruption. Frequency distribution: 30° of Knee Flexion. Reproduced with permission from Daniel, D.M., and Stone, M.L. 1990. Knee Ligaments: Structure, Function, Injury and Repair. Figure 24-8, New York: Raven Press.

patients who presented with acute hemarthrosis (presumed ACL tears), a KT-1000 criterion of >5 mm (20 lb. force) was useful in distinguishing "copers" from "non-copers" with a positive predictive value of 92% (Table VIII-6). Copers were participating in a running sport, had infrequent or no giving way episodes, and did not ask for an ACL reconstruction. Non-copers wished to have surgery. However, using the same data base, it appears that an alternative criterion of >7.5 mm difference with maximal manual force has a better sensitivity without significant loss of specificity (Table VIII-7).

TABLE VIII-6
Use of >5 mm Side-to-Side Difference on KT-1000 to Distinguish Between "Copers" and "Non-Copers" Following ACL Rupture (20 lb. Force)

	≤5mm	>5mm
Copers	37	6
Non-copers	64	65

Sensitivity = 50%
Specificity = 85%
Positive Predictive Value = 92%

Data from Daniel, D.M., and Stone, M.L. 1990. KT-1000 anterior-posterior displacement measurements. Chap. 24 in Knee Ligaments: Structure, Function, Injury, and Repair. eds. D.M. Daniel, et al. New York: Raven Press.

TABLE VIII-7
Use of >7.5 mm Side-to-Side Difference on KT-1000 to Distinguish Between "Copers" and "Non-Copers" Following ACL Rupture (Maximum Manual Force)

	≤7.5mm	>7.5mm
Copers	36	7
Non-copers	42	87

Sensitivity = 67%
Specificity = 84%
Positive Predictive Value = 93%

Data from Daniel, D.M., and Stone, M.L. 1990. KT-1000 anterior-posterior displacement measurements. Chap. 24 in Knee Ligaments: Structure, Function, Injury, and Repair. eds. D.M. Daniel, et al. New York: Raven Press.

2. MORE THAN MINOR WEAKNESS: Weakness of the hamstrings and quadriceps can be measured in a variety of ways. Two common quantitative techniques are:

- Isokinetic Machines Such as the "Cybex" or "Biodex": From a sitting position, the patient extends and flexes the knee as forcefully as possible while a mechanical arm attached to the ankle maintains constant angular speed. Force is measured as ft.-lbs. of torque at speeds which usually range from 60-300 degrees/sec. (Ironically, running involves angular speeds of much greater magnitude.) Numerous parameters, such as maximum torque, maximum work, and average work are measured, although there is no consensus as to which is more functionally relevant. Ninety percent or more of normal patients will have a side-to-side symmetry of at least 80% (Wyatt & Edwardo, 1981; Daniel, et al., 1982). Additionally, the ratio of hamstring to quadracep strength is normally around 80%.

- Hopping Tests: These are useful lower-limb functional tests that require a minimum of space, equipment, and time:

  a) Single Hop for Distance - The candidate stands on one limb, hops as far as possible, and lands on the same limb. The distance is measured and recorded. Each limb is tested two or three times, alternating between limbs.

  b) One-Legged Timed Hop - A distance of 6 meters is measured. The candidate is encouraged to use large forceful one-legged hopping motions in performing a series of hops over the total distance. A series of two tests are completed for each limb, with mean times calculated to the nearest one-hundredth of a second.

  Expected absolute values are a function of gender and level of sports participation. However, symmetry is unaffected by these factors. Normal symmetry is always $\geq$ 80% and is usually at least 85% (see Table VIII-8; Barber, et al., 1990). Daniel, et al. (1990) found that 95% of normals had a symmetry score of 90% in the single hop test.

The clinical significance of muscle weakness derives from the following considerations:

- The hamstring muscle can exert a posterior force on the tibia and, to a certain degree, plays a role in stabilizing the ACL-deficient knee (Solomonow, et al., 1987). Consequently, hamstring weakness is associated with a very poor prognosis. One study of unrepaired ACL patients found that the 56% (n=9) of those who manifested hamstring deficits >15% had poor results, compared to 36% (n=50) of patients with deficits of 15% or less (Bonamo, et al., 1990).

- Quadriceps weakness is also strongly associated with poor results Jarvinen & Kannus, 1987; Bonamo, et al., 1990). Although this muscle does not contribute to the stabilization of an ACL-deficient knee, weakness is a marker for common secondary complications such as pain, flexion contracture, and patellar irritability (Sachs, et al., 1989).

- Patients with abnormal hop tests are at very high risk of GW and having functional limitations during sports (Barber, et al., 1990; Noyes, et al., 1991). The major problem with these tests is low sensitivity: 50% if one test is performed, and 62% if two hop tests are conducted (using >15% asymmetry as a criterion for abnormal). However, specificity is very high (92-97%).

TABLE VIII-8
Limb Symmetry in One-Legged Hop Testing of Normal Patients

Limb symmetry index	Percent of normal patients	
	Hop for distance	Timed hop
.90	81%	71%
.85	93%	92%
.80	100%	100%

Reproduced with permission from Barber, S.D., et al. 1990. Quantitative assessment of functional limitations in normal and anterior cruciate ligament-deficient knees. Clin Orthop Rel Res. 205:204-214.

3. POOR EXERCISE HISTORY: The risk of developing GW or functional limitations is directly proportional to the extent of participation in stressful twisting, turning, and jumping activities (Finsterbush, et al., 1990; Holmes, et al., 1991; Noyes, et al., 1983). Therefore, denial of problems by a candidate must be discounted if such activities are avoided.

4. RECENT ACL TEAR OR REPAIR: The probability of developing recurrent GW and/or functional limitations appears to increase with time until perhaps 5 years after the tear has occurred (Table VIII-9). However, of those patients who request surgery within this time period, approximately 80% do so within 24 months of the original injury (Daniel, et al., 1992). Progressive deterioration may be due to recurrent injuries or the gradual stretching of secondary restraining structures, such as the medial and lateral capsules and the iliotibial track (Butler, et al., 1980). ACL reconstruction can apparently prevent this deterioration, as evidenced by multiple studies which indicate that stability is expected after 1 year post-op (Table VIII-9).

TABLE VIII-9
Development of Instability vs. Time

Author (n)	Observation Period	Change in Clinical Status During Observation Period
Unrepaired or Repaired Without ACL Reconstruction:		
Satku (55) 1986	Post-recovery vs. 6 yrs	27% not able to cope with same level of sports
Engebretsen (50) 1990	1 vs. 2 yr	Significant increase in prevalence of instability
Bray (45) 1988	1 vs. 3 yr	9% developed (+) pivot shift
Sandberg, et al. (57) 1987	1 vs. 3 yr	30% no longer "excellent"
Odensten (16) 1984	2 vs. 5 yr	38% became unstable
Feagin (32) 1976	2 vs. 5 yr	Prevalence of impairment with sports increased from 20% to 75%
Kaplan (52) 1990	2.5 vs. 7 yr	15% developed complaints of instability
Fetto (103) 1980	3 vs. 5 yr	Progressive deterioration observed over time period. By 5 yr, 85% of unrepaired knees rated as poor.
Bray (41) 1988	3 vs. 6 yr	37% developed objective instability
Sommerlath (45) 1991	3.5 vs. 12 yr	18% developed objective instability
Bonamo (30) 1990	4 vs. 8 yr	23% more patients had poor results
Noyes (103) 1983	<5 vs. >5 yr	Prevalence of GW increases slightly but not significantly
Repaired with ACL Reconstruction:		
Engebretsen (50) 1990	1 vs. 2 yr	No increase in prevalence of instability
Kochan (18) 1984	1 vs. 3 yr	No increase in instability
Howe (83) 1991	1 vs. 10 yr	No increase in failure rate
Harter (25) 1989	2.5 vs. 5 yr	No increase in instability

By careful consideration of these four risk factors for GW and functional disability, the evaluating physician can determine which candidates pose a direct threat if they were to perform patrol officer duties despite their denial of any current problems.

Special Note on Partial ACL Tears: The ACL ligament is composed of two major fiber bundles (antero-medial and postero-lateral) contained within a synovial sheath. A partial tear involving only one of these fiber groups is not uncommon and may appear as "intra-substance" bleeding on arthroscopy. This injury is frequently misdiagnosed as a meniscal tear due to complaints of locking and pain rather than instability (Farquharson-Roberts & Osborne, 1983; Finsterbush, et al., 1989). Although studies indicate that many patients with a partial tear do well with conservative care, there is a substantial risk of progression to complete tear (Table VIII-10). A recent study found that this risk was directly proportional to the amount of the tear: 86% of 3/4 tears and 50% of 1/2 tears progressed to full tears at follow-up 24-110 months later (Noyes, et al., 1989). One-quarter tears were much less likely to progress.

This study also found that other risk factors for progression included initial AP laxity and subsequent reinjury. In the group of 32 patients studied, 56% were reinjured within two years after the initial injury.

Special Note on the Use of Derotational Braces: These are often prescribed for a period of time after surgery, or as part of a conservative care regimen. Although they can reduce the risk of GW, they do not eliminate it. For example, Bonamo, et al. (1990) found that bracing reduced the prevalence of GW from 47% to 23% during sports participation in patients with unrepaired ACLs (Bonamo, et al., 1990). Moreover, it would be quite difficult to ensure that an officer is wearing the cumbersome brace at all times while on duty, particularly since it becomes uncomfortable with prolonged sitting or driving and would need to be worn on top of the uniform. Given these considerations, use of a derotational brace cannot be considered a reasonable accommodation.

TABLE VIII-10
Partial ACL Tears

Clinical Significance	
Buckley, 1989	40% fair-poor results 56% did not engage in pre-injury sports (N=25; follow-up = 4 years)
Kannus, 1987	33% did not engage in pre-injury sports 7% had to change occupations due to knee 15% had three or more reinjuries 68% had anterolateral instability on exam (N=41; follow-up = 8 years)
Odensten, 1985	All had at least good results (N=21; follow-up = 6 years)
Risk of Progression to Full Tear	
Sandberg & Balkfors, 1987	62% of 29 patients initially stable during anesthesia exam found to have instability 12-60 months later
Finsterbush, 1990	26% of 42 patients progressed to full tear within 4 years
Odensten, 1985	14% of 21 patients stable at 21 months developed instability by 70 months
Noyes, 1989 (c)	38% of 32 patients progressed to full tear at 24-110 months follow-up

b. RECOMMENDED EVALUATION PROTOCOL:

Carefully question candidates with a history of ACL tear about symptoms of pain, swelling, and instability. Those with partial tears should be asked specifically about locking. Details regarding surgery, physical therapy, and use of braces must be carefully ascertained. Inquire about pre-injury and post-injury sports participation. Determine why the candidate did not return to pre-injury status.

Medical records, including any operative reports should be reviewed.

The physical examination of both knees should include the following (in addition to that outlined in General Screening Recommendations):

- Lachman test
- Anterior drawer
- Pivot shift (preferably performed by an orthopedist)
- Range of motion (candidates should not have a flexion deformity of 10 degrees or limitation of flexion to <120 degrees. Note: these candidates need to see an orthopedist for manipulation - Mohtadi, et al., 1991).

Radiographs, including a lateral, standing AP, and a 45 degree patellar view (Merchant, et al., 1974), should be obtained.

Ancillary testing, such as arthrometer and isokinetic muscle testing, should be obtained whenever possible.

Evidence that a candidate is either at substantially increased risk of sudden incapacitation during a critical incident or may have significant functional impairment (despite denial of any problems) would include any of the following findings:

1. More than Minor Instability: >5 mm side-to-side difference on 20 lb. KT-1000 test, >7.5 mm side-to-side difference on maximum manual KT-1000, 2+ Pivot shift, or 2+ Anterior drawer;

2. More than Minor Weakness: Hop test, quadriceps, or hamstring asymmetry >15%;

3. Poor Activity History: Acceptable candidates should have a 1-2 year recent history of successful high-level, high-risk sports participation.

4. Recent Tear or Repair:

   - S/P ACL Reconstruction: Candidates should be restricted from engaging in foot pursuits for at least 12 months after surgery.
   - History of Partial Tear: Candidates should be restricted from engaging in foot pursuits for a minimum of 6 months - 2 years after the original injury or most recent episode of GW depending on the extent of the tear.
   - Full Tear Unrepaired or Repaired without ACL Reconstruction: Candidates should be restricted from critical incidents requiring running, cutting, and jumping for a minimum of 2-5 years after the original injury or most recent episode of GW.

10) COLLATERAL LIGAMENT INSTABILITY

Isolated complete tears of the medial collateral ligament (MCL) do not require surgery and, in general, have a benign prognosis. This has been observed even in injured football players (Jones, et al., 1986; Indelicato, et al., 1990). However, when there is concomitant anterior cruciate laxity, the prognosis is poor. For example, one follow-up study of 27 patients found that most had symptoms and muscle weakness (Kannus, 1988).

Candidates with a history of MCL tears should be carefully examined for AP laxity and thigh atrophy. If the candidate is asymptomatic, has no cruciate laxity or significant thigh atrophy (>1/2"), no restrictions can be justified, even if residual MCL laxity to valgus stress is present. In these cases, radiographs and record review are not necessary.

The evaluation of candidates with tears of the lateral collateral ligament (LCL) is similar to that of MCL deficient candidates. Although this injury is quite uncommon and therefore fewer studies exist, several suggest that the prognosis for partial tears (grade II) is very good (Ellsasser, et al., 1974; Kannus, 1989). However, complete tears (grade III) are often associated with cruciate damage, and in these cases the prognosis is particularly poor (Kannus, 1989).

11) ACROMIOCLAVICULAR (AC) SEPARATION

There are two common classifications of AC injuries, one developed by Tossy, et al. (1963) and the other by Allman (1967). Table VIII-11 describes these two classification schemes.

TABLE VIII-11
Classification of Acromioclavicular Injuries

Type of Grade	Allman (1967)	Tossy (1963)
I	Acromioclavicular ligament sprain; joint stable; normal x-ray films acutely	No gross deformity
II	Acromioclavicular ligament and capsule torn; coracoclavicular ligaments stretched but intact; x-ray elevation of clavicle less than width of clavicle	Distal clavicle displaced up to one half of the normal superior-inferior height of joint as compared with normal side
III	Same injury as grade II plus tear of the coracoclavicular ligaments; x-ray elevation of clavicle above superior surface of acromion	Separation of joint greater than 1/2 of its normal height, with wide separation of the coracoclavicular relationship

Reproduced with permission of Wickiewicz, T.L. 1983. Acromioclavicular and sternoclavicular joint injuries. Clinics Sports Med. 2(2):429-437.

Candidates with a history of Grade I or II separations within the last several months should be deferred until they are asymptomatic, non-tender, and have a normal range of motion with full strength for at least one month. A thorough history, examination, and record review is important to identify the estimated 8% of Grade I and 13% of Grade II patients who suffer persistent, significant symptomatology (Cox, 1981).

Candidates who have recently suffered a Grade III injury should be deferred for at least three months from the date of injury and for at least one month after the resumption of full activity to eliminate the majority of those who will do poorly and require surgery (Taft, et al., 1987). At that time, the candidate should be carefully questioned regarding recent symptoms, especially with heavy loads, since an estimated 25% will have difficulty due to residual pain (Dias, et al., 1987). Candidates with pain, weakness, tenderness, or a significantly decreased range of motion should be deferred until evaluated by an orthopedist.

Candidates with remote histories of AC separation require a thorough history and examination. In general, evidence of persistent Grade III separation is not of concern if the candidate is asymptomatic, the examination is otherwise negative, and there is no history of pain lasting more than 3 months within the last year.

Forty-five percent of patients with AC separations will have some evidence of radiographic degenerative disease, but these changes are generally poorly correlated with symptomatology (Taft, et al., 1987; Smith & Stewart, 1985). Therefore, radiographs are not helpful from a prognostic perspective. However, they may be useful to establish a baseline for future workers' compensation purposes. In certain cases, radiographs may also help one distinguish between a history of AC separation and a shoulder dislocation.

12) SHOULDER SUBLUXATION AND DISLOCATION

a. GENERAL CONSIDERATIONS:

The shoulder joint is a highly mobile structure whose stability depends on a complex interaction between static stabilizers, such as the glenoid labrum and the glenohumeral ligaments, and the dynamic forces of the surrounding musculature which compress the head of the humerus into the glenoid fossa. Clinically, however, instability is most commonly associated with tearing of the labrum. Subsequent subluxation and dislocation may be uni- or multi-directional, but usually occurs anteriorly. In these patients, the joint is most unstable when the arm is stressed in an externally rotated and fully abducted overhead position. Only anterior instability will be discussed in this section.

Patients with mild anterior subluxation may only complain of mild pain (Warren, 1983). This is related to inflammation within the rotator cuff and capsule due to abnormal traction placed on these tissues. Those with more severe instability are aware of episodes of subtle movement of the shoulder in and out of the socket, and complain that they do not "trust" the shoulder (Simonet & Cofield, 1984). Often these episodes are associated with a severe transient pain that shoots down the arm which may go "numb" or "dead." The sensation will gradually clear after several minutes, but will be followed by feelings of weakness (Warren, 1983).

In anterior dislocations, spontaneous relocation does not occur, and there is total loss of use of the arm. Patients with a history of dislocation may also complain of symptoms consistent with intermittent subluxation.

Since both subluxation and dislocation can cause sudden incapacitation of an officer, the physician must determine which candidates are at a significantly increased risk of recurrence during activities such as wrestling combative arrestees or climbing walls.

SUBLUXATION: Risk assessment of candidates with subluxation is made somewhat difficult due to a lack of prospective studies. Typically, mild instability only causes pain with repetitive motion activities (such as weight training). It is not known how many of these patients will progress to suffer the symptoms of

more severe instability described above. Furthermore, the prognosis of patients who already have incapacitating arm symptoms is also unknown. These patients are treated with physical therapy to strengthen the internal and external rotators to a level equal to 20% of body weight (Matsen & Zuckerman, 1983), but there are no studies that document the long-term effectiveness of this treatment.

Given this lack of knowledge and the potential for injury to others, the physician must assess relative instability by looking for the following clinical signs. Unfortunately, these signs are often not present even with a history of dislocation.

- Apprehension Sign: The arm of the relaxed, supine candidate should be abducted to 90 degrees and progressively extended and externally rotated with gentle but persistent pressure over a number of minutes. A positive sign is evidence of apprehension or subluxation.

- Hill-Sachs' Lesion: This cortical impression fracture of the posterolateral humeral head is caused by the edge of the glenoid during dislocation (Hill & Sachs, 1940). Scapular anteroposterior and axillary view radiographs should be obtained.

If either of these signs are present, the candidate has more than mild instability and is at increased risk of dislocation. This risk warrants a period of observation before clearance for full duty.

DISLOCATION: The prognosis for recurrence is generally very high unless surgery is performed. Published longitudinal studies have identified several factors that are relevant:

- Activity Level: Dislocation is associated with physical trauma or athletic participation in about 90% of cases (Hovelius, et al., 1983; Hovelius, 1987). In the remaining 10% of cases, the dislocation occurs with movement that a normal shoulder should tolerate. However, the degree of trauma associated with the first dislocation is not a prognostic factor for future recurrences (Hovelius, 1987).

- Radiographic Abnormalities: Evidence of fracture of the greater tuberosity of the humerus on the original radiograph indicates a very low to non-existent probability of recurrence (Hovelius, 1987; Rowe & Sadellarides, 1961). This lesion is found in about 8% of patients <30 years old and in about 20% of those older. Absence of a Hill-Sachs' lesion indicates a somewhat improved prognosis, but has limited use since 11-71% of these patients (depending on age) will have a recurrence within 5 years (Hovelius, 1987).

- Age: Numerous studies (e.g. Hovelius, 1987; Simonet & Cofield, 1984) have documented that age is the most important risk factor for recurrence (although most did not control for activity level). It appears the glenohumeral joint is inherently more lax in younger persons. This is evident from an observation by Hovelius (1987) that primary dislocation occurred spontaneously without trauma in 14% of patients <23 years old, compared to 5% of those 23-29 years old, and 1% of patients 30-40 years old.

  Several studies have found recurrence rates in the range of 60-90% in patients <30 years old (Rowe, 1956; Rowe & Sadellarides, 1961; Henry & Genung, 1982; Simonet & Cofield, 1984). However, the best study for risk assessment purposes is that by Hovelius (1987). This study is unique in that it was prospective, all patients had the same length of follow-up (five years), it was the largest published series of primary dislocation in patients age 40 or less, and the drop-out rate at follow-up was less than 1%. Tables VIII-12-14 were derived from this study.

  Table VIII-12 shows the percent of patients in three age groups who experienced at least one recurrence after five years of follow-up. The rate decreases from 69% in patients <23 years old to 25% in those 30-40 years old. Some patients may not experience another dislocation, but complain of instability due to subluxation. When these patients are added to those who have redislocation, the total percentage of patients who have continuing problems increases to 72% in the younger and 36% in the older group (Table VIII-13).

TABLE VIII-12
Percent of Patients Who Experience at Least One Recurrence of Anterior Dislocation by Age and Years of Follow-Up*

Age	Two Years	Five Years
12-22 (N=94)	51%	69%
23-29 (N=55)	31%	51%
30-40 (N=76)	16%	25%

*Cases with tuberosity fractures were excluded.
Data from Hovelius, L. 1987. Anterior dislocation of the shoulder in teenagers and young adults. J Bone Jt Surg. 69A:393-399.

TABLE VIII-13
Percent of Patients Who Experience at Least One Recurrence of Anterior Dislocation or Subjective Instability by Age and Years of Follow-Up*

Age	Two Years	Five Years
12-22 (N=94)	67%	72%
23-29 (N=55)	53%	62%
30-40 (N=76)	30%	36%

*Cases with tuberosity fractures were excluded.
Data from Hovelius, L. 1987. Anterior dislocation of the shoulder in teenagers and young adults. J Bone Jt Surg. 69A:393-399.

- Time Since Last Recurrence: Most patients who will have a recurrence will do so within two years (Hovelius, 1987; Simonet & Cofield, 1984). However, a substantial proportion of patients doing well after two years will have recurrence by five years of follow-up (see Table VIII-14 derived from Hovelius, 1987).

TABLE VIII-14
Percent of Patients With No Dislocation Recurrence at Two Years of Follow-Up Who Experience at Least One Recurrence After Three Additional Years of Follow-Up*

Age	Number without recurrence after two years	Percent who dislocate by five years
12-22	46	37%
23-29	38	29%
30-40	64	9%

*Cases with tuberosity fractures were excluded.
Data from Hovelius, L. 1987. Anterior dislocation of the shoulder in teenagers and young adults. J Bone Jt Surg. 69A:393-399.

It is clear that a two-year deferral period would not be sufficient to consider a candidate "cured" regardless of age. Considering even five-year survivors as cured is questionable, given the substantial dislocation rates between two and five years. However, 98% of patients who ultimately have surgery have their first recurrence within five years after the initial dislocation (Hovelius, et al., 1983). Based on this consideration and the lack of follow-up data beyond a five-year period, it is reasonable to consider candidates who are 40 years old or younger at the time of the initial dislocation to be at substantial risk until five years have elapsed since their last dislocation.

For patients who are older than 40 years at the time of their first dislocation, the recurrence rate is substantially reduced. Simonet and Cofield (1984) did not observe any redislocation in a group of 41 patients followed from 2-4 years. However, 12% had unsatisfactory results due to symptomatic instability. These data would support a deferral period of two years for these candidates.

- Conservative Treatment: Conservative treatment consists of immobilization in a sling for a few weeks followed by physical therapy.

  Hovelius (1987) showed that immobilization for 3-4 weeks did not reduce the rate of recurrence. However, there is some data which suggests that longer immobilization improves the prognosis, but does not provide a "cure" with any certainty (Simonet & Cofield, 1984; Near & Welsh, 1977). For example, Simonet and Cofield (1984) found that six weeks of restriction from full activity decreased probability of "unsatisfactory" results from 85% to 44%.

  Patients with instability appear to have lower internal rotator strength in their shoulders as compared to normals (Warner, et al., 1990). However, Simonet and Cofield (1984) found that those referred to physical therapy after a dislocation did not have better long-term results. Warren's (1983) overall impression is that "exercise will benefit some patients with subluxation but is not helpful in dislocation." Aronen and Regan (1984) claimed that while rehabilitation decreased recurrence rates, 28% of a young cohort still required surgery after five years of follow-up. Thus, muscle development has not been shown to prevent recurrent dislocation with any certainty.

- Number of Recurrences: If a patient has had one recurrence, the risk of another is substantially increased. For example, in the Hovelius study (1987), 12/19 patients had another dislocation within three years, and five of these patients requested surgery. After two recurrences, 25/31 patients had another dislocation within three years, and seven of these requested surgery. Simonet and Cofield (1984) similarly observed that no patient with two recurrences had a satisfactory result.

- Surgery: The several procedures effective in stabilizing the shoulder all have associated complications. Nearly all patients will have some loss of abduction and external rotation. Post-operative subluxation or dislocation occurs in up to 13% of patients, depending on the procedure and the activity level of the patient (Miller, et al., 1984; Collins, et al., 1986; Hovelius, et al., 1983; Protzman, 1980). Moreover, between 18-35% of post-operative dislocations occur more than two years after surgery (Morrey & Janes, 1976; Rowe, et al., 1978). Given these considerations, it is not unreasonable to defer these candidates until completion of at least a 2-3 year uneventful post-surgical period.

In evaluating these candidates, a final consideration may be the presence of severe degenerative joint disease. Recent research suggests that degeneration of the joint will occur within 10-15 years, even with surgical stabilization. Although not a risk factor for dislocation or sudden incapacitation, these candidates may be at a substantial risk of disability from the unavoidable trauma of shotgun recoil forces and wrestling.

b. RECOMMENDED EVALUATION PROTOCOL:

Candidates with a history of subluxation should be specifically questioned regarding any symptoms referable to the arm, such as pain, numbness, or weakness. Examination should include testing for apprehension (see above). Radiographs should include A-P and axillary views.

Those with a history of dislocation should be questioned regarding dates of occurrences, treatment, and subsequent symptoms of instability. Some candidates will report a history of acromioclavicular separation when asked about dislocations. A careful history and having the candidate point to the location of pain will usually clarify the diagnosis. If doubt remains, a radiographic series may show a Hill-Sachs' lesion. To avoid unnecessary radiation to candidates with dislocations, radiographs should be deferred until it has been determined that the candidate is otherwise qualified. In these cases, the radiograph is then used to examine the condition of any post-surgical hardware and to determine the extent of degenerative changes.

Record review is strongly recommended for both groups of candidates. In candidates who have had only one dislocation, an attempt should be made to obtain any radiographs taken at the time of dislocation to determine if a tuberosity fracture was present.

HISTORY OF SUBLUXATION ONLY

GROUP I: NO HISTORY OF ARM PAIN OR WEAKNESS, NEGATIVE APPREHENSION SIGN AND NO HILL-SACHS' LESION ON RADIOGRAPHS

In general, no restrictions are warranted. However, the physician may want to consider whether a candidate with subluxation will be able to tolerate any weight training required in the academy.

GROUP II: HISTORY OF ARM PAIN OR WEAKNESS, OR POSITIVE APPREHENSION SIGN, OR HILL-SACHS' LESION ON RADIOGRAPHS

To substantially reduce the risk of sudden incapacitation, these candidates should be restricted from wrestling and overhead activities for a period of two years from the date of their last episode of arm symptoms. The presence of an apprehension sign or Hill-Sachs' lesion should warrant an observation period of two years to substantially reduce the risk of sudden incapacitation.

HISTORY OF ANTERIOR DISLOCATION

GROUP I: FRACTURE OF THE GREATER TUBEROSITY PRESENT ON FILMS OF PRIMARY DISLOCATION

No restrictions or deferral is warranted if the candidate is otherwise doing well and has been asymptomatic for one year.

GROUP II: PRIMARY DISLOCATION AT AGE >40, OR S/P SURGERY (ANY AGE)

To substantially reduce the risk of sudden incapacitation, these candidates should be restricted from wrestling and overhead activities for a period of two years from the date of their last dislocation or surgery.

GROUP III: PRIMARY DISLOCATION FIRST OCCURRING AT AGE <40

To substantially reduce the risk of sudden incapacitation, these candidates should be restricted from wrestling and overhead activities for a period of five years from the date of their last dislocation.

13) FINGER AMPUTATIONS/ARTHROSIS

These conditions are not uncommon among patrol officer candidates. The physician must assess whether the candidate's ability to tightly grip and handle either a baton or firearm would be significantly impaired, since an officer's life may depend on the ability to resist firearm take-away.

In many cases, the physician will be able to make this determination after examination. Amputations that do not extend beyond the distal interphalangeal joint will usually not cause impairment. Objective testing of grip strength with a dynamometer, such as the "Jamar," is also helpful. Although a guideline for minimum grip strength is unavailable, the physician can confidently clear someone if strength is symmetrical after considering hand dominance (± about 10%).

In cases where there is some question as to the significance of objective weakness or deformity, the physician should recommend that the hiring agency arrange a special handgun and baton handling assessment by the training academy, with final determination made by the appropriate professionals.

14) RETAINED HARDWARE

An assortment of screws, pins, nails, and plates are often used in orthopedic surgery. In many cases, controversy exists regarding when and whether retained hardware should be removed. Although patients and orthopedists may wish to avoid another procedure, removal may be indicated by migration into joint spaces. Similarly, palpable hardware may increase the risk of serious skin breakdown with minor trauma.

For these reasons, the physician should physically examine and obtain a radiograph of the area in question. If the hardware is palpable or there has been migration into a joint, an orthopedic opinion regarding the necessity of removal should be obtained. The candidate should be required to comply with this recommendation.

15) LEG LENGTH DISCREPANCY

a. GENERAL CONSIDERATIONS:

A difference in leg lengths of 1" or more should theoretically cause asymmetrical torsional stress on the L5 disc (Wiltse, 1971). However, large population studies do not show an increased incidence of back pain unless the discrepancy is more than 1.7" (Hult, 1954). To a great extent, the clinical significance of a leg length discrepancy depends on the height of the individual. For example, a 1" difference may be of little concern for a tall person for whom it represents a small percentage of the total length of the limb, whereas for a short person, it may be associated with an unacceptable limp and backache (Friberg, 1983). Another factor is whether the leg shortening occurred secondary to fracture in adulthood. These patients are more likely to have back pain than those with congenital shortening.

b. RECOMMENDED EVALUATION PROTOCOL:

Leg lengths should be measured if there is a history of back problems or an obvious pelvic tilt. Candidates with a leg length difference of 1" or more should be required to obtain a shoe-lift from a podiatrist or physician before being passed. It would be prudent to emphasize the importance of using the lift to the candidate to increase the chances of compliance.

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NEUROLOGY[1]

I. INTRODUCTION

A. OUTLINE OF HIGHLIGHTED CONDITIONS

1) Cranial Defect

2) History of Seizure

3) Head Trauma Without History of Seizure

4) Primary Headache Disorders

B. IMPLICATIONS FOR JOB PERFORMANCE

Abnormalities in neurological functioning can be quite diverse, and therefore may potentially limit the ability to perform virtually all of the numerous physical tasks required of patrol officers. Beyond simple physical performance impairments, neurological abnormalities also have the potential to cause sudden incapacitation as well as impairment of cognitive functioning.

II. MEDICAL EXAMINATION AND EVALUATION GUIDELINES

A. GENERAL SCREENING RECOMMENDATIONS

1) History:

The general questions found on the Medical History Statement do not require elaboration if answered negatively.

2) Examination:

A thorough neurological examination on every candidate, regardless of history, would be quite time-consuming. Alternatively, an adequate screening exam for

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[1] Author: R. Leonard Goldberg, M.D.
Participating specialists: Steven Holtz, M.D.; Lee Kudrow, M.D.; Richard Riemer, M.D.; Nazhiyath Vijayan, M.D.

candidates with a negative history could consist of the following components:

- Eyes: Examine fundus for papilledema, oculomotor function, and nystagmus.
- Cerebellar: Have candidates raise their arms in front of them with palms up. In this position, observe any drift or tremor; have candidates perform the finger-to-nose and Rhomberg test.
- Reflexes: Examine biceps, triceps, knee, ankle, and Babinski's.
- Gait: Note any abnormality of arm swing, leg swing, heel strike, or foot strike. Distance between medial malleoli should not exceed 1" (see additional tests in Musculoskeletal chapter).
- Sensory: Use 128 cps. tuning fork to detect absence of vibratory sensation on big toe bilaterally. Record result as present or absent, rather than duration of sensation.

B. EVALUATION OF COMMON CLINICAL SYNDROMES

1) CRANIAL DEFECT

a. GENERAL CONSIDERATIONS:

Cranial defects commonly occur as the result of surgical burr holes or craniotomies that have healed with non-union. Both of these lesions substantially increase the risk of sudden incapacitation during combative situations. A burr hole of approximately 2 cm in diameter could allow penetration by a finger or other narrow object. The resulting pressure on the galea could cause sudden and severely excruciating pain. "Floating" bone islands do not protect the brain against blunt trauma.

In most cases, filling the defect with methyl methacrylate or similar surgical polymer could eliminate this risk. This procedure is commonly performed by neurosurgeons and has a low morbidity rate.

Note: Cranial defects due to evacuation of childhood epidural hematomas will sometimes develop secondary calcification. These may have the appearance of a depressed skull fracture on radiographs, but are often well-fused to the cranium and provide adequate protection.

b. RECOMMENDED EVALUATION PROTOCOL:

The physician should obtain skull radiographs on any candidate with a history suggesting the possibility of cranial defect. Candidates with floating bone

islands or burr holes >2 cm should be restricted from combative situations. This restriction could be rescinded if the skull defect is repaired. Candidates who have calcified defects should be referred to a neurosurgeon for an opinion regarding whether the calcium deposit has adequate strength to resist pressure.

2) HISTORY OF SEIZURE

a. GENERAL CONSIDERATIONS:

Seizure disorders may create a risk of substantial harm to the candidate and the public in several ways:

- A seizure triggered by stimuli that occur during a critical incident could result in a failure to perform in a life-threatening situation;

- A seizure at other times also threatens the safety of both the officer and others (e.g., a suddenly incapacitating seizure while driving or directing traffic). Even a seizure during routine questioning of a suspect can turn into a critical situation if it causes an officer to lose control of his/her weapon;

- Chronic or intermittent impairment in psychomotor ability (due to the condition itself or to medication taken to control symptoms) can interfere with functioning in both critical incidents and during routine activities.

The following discussion is intended to assist screening physicians in addressing each of these concerns on an individualized basis. An outline of the relevant considerations is presented in Table IX-1.

ASSESSING ON-DUTY SEIZURE RISK

Non-Random Seizures

In general, only 20% of seizures occur due to precipitating factors, and not all persons with epilepsy are susceptible. Therefore, the physician must determine, on an individual basis, whether a candidate is at risk of having a seizure induced by stimuli that are encountered during either routine patrol officer activities (e.g., a light flickering between trees may cause reflex seizures), or during critical incidents (e.g., emotional stress, physical stress, or reflex stimuli such as flashing lights or sudden sounds).

Table IX-1:
Evaluation Outline for Assessing Candidates at Increased Risk of Seizure

NON-RANDOM SEIZURE
- Susceptibility to environmental stimuli, emotional stress, reflex triggers

RANDOM SEIZURE
- Clinical Subcategories
  - Single unprovoked idiopathic seizure
  - Epilepsy, controlled on medication
  - Epilepsy, presently off medication
  - Seizure after head trauma
- Job Related Considerations
  - Percentage of time on duty
  - Sleep deprivation
  - Pattern and timing of seizures
  - Impact of auras

ASSESSING EFFECT OF PSYCHOMOTOR IMPAIRMENT
- Medical side-effects
- Transient cognitive impairments

The physician will be able to identify the few candidates who are susceptible on the basis of their medical history. Unless these candidates can demonstrate excellent control with medication, their risk of a seizure during routine patrol officer duties would clearly constitute a direct threat.

Random Seizures

There are numerous risk factors to consider when determining an individual's probability of randomly suffering a recurrent seizure. The relative importance of these risk factors varies by clinical subcategory. Therefore, an individualized risk assessment can be best accomplished by considering risk factors within each clinical subcategory. The clinical subcategories discussed below include:

A. SINGLE UNPROVOKED IDIOPATHIC SEIZURE

B. EPILEPSY, CONTROLLED ON MEDICATION

C. EPILEPSY, PRESENTLY OFF MEDICATION

D. SEIZURE AFTER HEAD TRAUMA

A. SINGLE UNPROVOKED IDIOPATHIC SEIZURE

An unprovoked idiopathic seizure is one that occurs in the absence of an identifiable alteration of systemic metabolic function or insult to the structural integrity of the brain. EEGs and CAT scans are often negative. Seizures associated with sleep deprivation are considered idiopathic.

There are numerous studies that evaluate the risk of seizure recurrence. Meta-analysis is difficult due to differences in definitions and prevalence of risk factors. The usefulness of many studies is also limited by short follow-up periods. However, one major study (Hauser, et al., 1990) has both adequate follow-up (average four years) and a large subset of patients (n=78) that are clearly defined as "idiopathic" with no risk factors for recurrence. Therefore, this study provides useful baseline recurrence rates (Table IX-2). As would be expected, these rates are lower than those found in any other study, since other studies include patients with positive risk factors for recurrence.

TABLE IX-2:
Annual Probability of Seizure Recurrence After a Single Unprovoked Seizure for a Candidate with a Normal EEG Who is Taking Medication (80% compliance)

Probability of Seizure Recurrence Between:				
0-12 Months	**13-24 Months**	**25-36 Months**	**37-48 Months**	**49-60 Months**
7%	**6%**	**3.7%**	**2.3%**	**1.6%**

Note: Data from Hauser, et al., 1990.

In the Hauser study, 80% of the patients were taking medication as prescribed, so the rates shown in Table IX-2 are representative of a treated population with some non-compliance. A 20% rate of non-compliance in "treated" patients is probably not atypical. In a randomized clinical trial of treatment efficacy, Musicco (1997) also found that treatment was interrupted or not initiated per the patient's decision in 20% of patients assigned to the "treatment" group.

There are two major risk factors that have been shown by multiple studies to significantly increase the risk of seizure in this group of patients: (1) an abnormal EEG; and (2) nontreatment.

(1) Abnormal EEGs: Many studies have found an abnormal EEG to be a significant risk factor for recurrence. However, there has not been agreement on the nature of the predictive abnormality. In the Hauser study, only a generalized spike and wave (GSW) pattern was associated with an increased recurrence risk (rate ratio =2.69). Cleland (1981) found a recurrence rate of 53% in patients with spike and wave patterns compared with 26% in patients with a normal EEG. In a multicenter study, having "epileptiform" abnormalities was associated with a 1.7 fold increase in risk (First Seizure Trial Group, 1993). If either of these abnormalities is present, it would be appropriate to approximately double the recurrence rates in Table IX-2.

(2) Nontreatment: Until recently, the medical literature did not support the use of medication after an initial seizure. However, these earlier studies were non-randomized. More recently, several randomized studies have been published which

do show treatment efficacy. Musicco (1997) observed that 24% of the treated group (n=215) seized within 24 months vs. 42% of the non-treated group (n=204). Gilad (1996) found a 22% recurrence rate within 36 months in treated patients (n=45) vs. 71% in non-treated (n=42). While not reaching statistical significance, Bora (1995) found an odds ratio of 1.6 for seizure recurrence in non-treated patients (n=85). Overall, these studies indicate that it would be appropriate to approximately double the rates in Table IX-2 for candidates who are not on medication or poorly non-compliant. On the other hand, it would be appropriate to reduce the rates in Table IX-2 by approximately 20% if excellent compliance can be documented, since the Hauser rates were influenced by non-compliance to this degree.

B. EPILEPSY, CONTROLLED ON MEDICATION

For a candidate with idiopathic epilepsy (two or more seizures), the annual risk of recurrence primarily depends on the recency of the last seizure. For newly diagnosed patients, the best estimates derive from Cockerell (1997), who followed over 200 patients with idiopathic epilepsy. Occurrence rates derived from this study show that the annual risk of seizure is extremely high in the two years following the diagnosis (Table IX-3). Although not directly comparable, the recurrence rates in Table IX-3 are consistent with estimates derived from several other studies (Rodin, 1965; Juul-Jensen, 1968; Elwes, 1984; Hauser, 1998; Overweg, 1987).

TABLE IX-3:
Annual Risk of Seizure Recurrence in Newly Diagnosed Epileptic Patients (70% on Medication) by Period of Remission

Seizure Status	Risk of Seizure in Next 12 Months
Newly diagnosed	**60%**
1 year without seizures	**18%**

Note: Data derived from Cockerell, 1997.

For prognoses on patients with longer seizure-free periods, the best study is by Chadwick (1993) who derived and validated a multivariate model for making individualized risk assessments based on studying over 500 patients with epilepsy who had achieved a minimum remission of at least two years. This equation, contained in Table IX-4, can be used for candidates who have not seized for at least two years (refer to "Currently On Rx" sections of table).

While medication can reduce the risk of recurrent seizure in patients with idiopathic epilepsy, it does not eliminate it, even in highly compliant patients (Cramer, 1989). In the study by Cockerell (1997) used in Table IX-3, approximately 70% of the subjects were on medication. Therefore, to factor in the use of medication in an applicant for whom compliance can be documented, it would be reasonable to

reduce the rates cited in Table IX-4 by approximately 30%. In the Chadwick study, however, serum levels of medications were measured but not found to be a significant factor in the multivariate analysis.

TABLE IX-4:
Multivariate Model for Making Risk Assessments on Candidates Who are 2+ Years Seizure-Free

Recurrence Risk	**Medication Status**	
	Currently On Rx	**Currently Off Rx**
Within Next 24 Months	**$1 - 0.89^z$**	**$1 - 0.69^z$**
Within Next 24 Months	**$1 - 0.79^z$**	**$1 - 0.60^z$**

Where $z = e^T$ (e = 2.718)

T = (-1.3) + 0.50 if taking two or more medications
+ 0.35 if seizures continued after the start of medication
+ 0.35 if patient has tonic-clonic seizures
+ 0.50 if patient has myoclonic seizures
+ 0.20 if EEG is abnormal
+ (2.0 / number of years since last seizure)

Note: Data derived from Chadwick, 1993.

C. EPILEPSY, PRESENTLY OFF MEDICATION

Due to concerns regarding the toxicity of long-term anti-epileptic medication, many neurologists will attempt to gradually withdraw medication if a patient has been seizure free for 2-5 years. Among adults, the cumulative probability of relapse is 20-70% (Overweg, 1987; Callaghan, 1988; Oller-Daurella, 1977; Juul-Jensen, 1968) depending on a number of risk factors such as an abnormal EEG at the time of drug withdrawal, the age of onset, and the type of epilepsy.

However, the primary determinant of the annual risk of seizure is the time that has elapsed since withdrawal was initiated. In a meta-analysis of 25 studies (Berg & Shinnar 1994) found that the risk of recurrence was 29% (95% CI, 24-34%) in the first two years following withdrawal initiation. While this study examined the strength of the three risk factors mentioned above, the data couldn't be used for individualized risk assessments. For this purpose, the authors suggested use of the Chadwick, 1993 study.

However, using the Chadwick, 1993, study, even individuals with no risk factors have a substantial risk of recurrence during the first two years. During the first post-withdrawal year, the risk of recurrence is 14-24% depending on whether the subject was seizure-free for 5 or 2 years before discontinuation, respectively. If no seizure occurs in the first year post-withdrawal, the risk of seizure is 6-10% during the second year.

After two years following withdrawal, Chadwick (1996) concludes based on his data and that of Berg & Shinnar (1994) that the added risk of recurrence caused by drug withdrawal is only slight. Therefore, for risk estimates in candidates who are two years or more post-withdrawal, the reader should use the section above which gives estimates for applicants with epilepsy on medication.

D. SEIZURE AFTER HEAD TRAUMA

Depending on its severity, head trauma can be a major risk factor for seizures. The risk of an initial seizure after trauma is discussed later in HEAD TRAUMA WITHOUT HISTORY OF SEIZURE. The purpose of this section is to evaluate the risk of recurrence after an initial seizure. The primary risk factors are the timing of the seizure in relationship to the trauma, and the severity of the trauma.

Early Post-Traumatic Seizure(s): Seizures occurring within the first week post-injury are generally considered to be due to the direct effects of the trauma and are rare in mild injuries. A major study of civilian head injuries found that the occurrence of early seizures was not a risk factor for late seizures after statistical adjustment for other risk factors such as injury severity in a multivariate model (Annegers, 1998). For further consideration, see the section below on HEAD TRAUMA WITHOUT HISTORY OF SEIZURE.

Single Late Post-Traumatic Seizure: There is a high probability that a late post-traumatic seizure will reoccur. The best study of civilian head injuries is a two-year follow-up study of 63 patients by Haltiner (1997). In this study, 82% suffered another seizure within one year. Among those seizure-free for one year, approximately 20% seized in the following year. Multilinear regression analysis indicated that depressed skull fracture and subdural hematoma were significant risk factors (odds ratios equal approximately 2). However, the one-year recurrence rate was 65% even in the lowest risk group. Medication had only a small beneficial effect. Among the 47 patients who were compliant, 68% seized within two years.

Post-Traumatic Epilepsy (PTE): The occurrence of two or more late post-traumatic seizures fulfills the diagnosis of epilepsy. In the largest long-term (mean follow-up = 8 years) study of 57 patients (Pohlmann-Eden, 1997), only 35% (20) became seizure-free (no seizures within the last 3 years) after the diagnosis. The major risk factors for poor seizure control were a history of missile injury (OR > 10), combined seizure types (OR = 2.5), having >1 seizure/month (OR = 2), and non-compliance with medication (OR = 9). About half of the 40 medication-compliant patients became seizure-free; only 1/17 of the non-compliant patients were so fortunate. While this represents the largest study of PTE, it does not allow one to estimate annual risks of recurrence. It also is based on patients who were referred to a specialized epilepsy clinic in Germany, and therefore may not be representative of the typical PTE patient. With these limitations in mind, it is recommended that the physician use the risk estimates found above in the sections on epilepsy as a first approximation.

OTHER FACTORS AFFECTING SEIZURE RECURRENCE RISK ASSESSMENTS

After estimating the annual seizure recurrence risk, the physician should consider the likelihood that a recurrent seizure would in fact create a direct threat of harm to the officer or others while performing routine patrol duties. Relevant factors can include the percentage of time that the officer will be on duty, the impact of sleep-deprivation, the pattern or timing of seizures, and the impact of auras:

The percentage of time that the individual will be on-duty: Full-time employment typically involves working approximately 2000 hours out of 6000 waking hours per year. Therefore, if seizures occurred only while awake, and were truly random, the probability of seizure while on-duty would be about 1/3 of the annual total probability.

Sleep-deprivation: This is the most common seizure threshold-lowering factor and affects approximately 30-40% of patients with seizure disorders (Janz, 1974; Broughton, et al., 1984; Mattson, et al., 1965). As little as 24-26 hours without sleep may trigger a seizure. Therefore, if a law enforcement agency requires its officers to work 24-hour shifts, this could substantially increase the risk of seizure while on duty for susceptible individuals. Susceptibility can be ascertained by history, or by a sleep-deprived EEG. However, since working 24-hour shifts is not common, this factor should only be considered by those agencies that can document the need for such work schedules.

Nocturnal or first awakening seizures: Some individuals will report having seizures only while at sleep or upon awakening. This pattern would substantially reduce the risk of a seizure while on-duty. However, the pattern should be well established for a number of years before it is considered. The few existing studies of prognosis in sleep epilepsy found that 33% of patients eventually developed daytime seizures when followed for two years (Gibberd & Bateson, 1974; Okuma & Kumashiro, 1981).

Auras: All seizures are not alike in terms of the risk that they create for the prospective patrol officer. The physician must consider the functional significance of the individual's seizure activity, and to what extent warning "auras" may reduce the likelihood of consequences from this impairment. For example, one study found that only 27% (n=11) of simple partial seizures occurring while driving resulted in an accident, compared to 76% (n=55) of complex partial seizures (Gastaut & Zifkin, 1987). However, a history of auras reduced the risk of accident during a complex partial seizure to 33% (n=33). (Note: the individuals studied were not patrol officers or otherwise driving as part of their jobs.)

Although auras may provide a warning period before a seizure, this warning period may be very brief. Many auras themselves can also cause significant impairment of the senses and judgment. Additionally, although auras generally do not go away with time (Kuhl, 1967), the physician should consider the regularity and pattern of occurrence.

NON-SEIZURE RELATED IMPAIRMENTS

The evaluating physician must also consider whether the candidate is subject to chronic or intermittent interictal impairment, which could interfere with functioning during both critical incidents and routine activities. This impairment could be caused either by side effects of anti-epileptic drugs (AEDs) or interictal EEG discharges.

(1) Drug impairment: About 30% of patients will experience moderate or severe side effects from anti-epileptic medication. The spectrum of potential side effects from AEDs is quite broad and includes cognitive impairment, visual effects, and ataxia. The occurrence of many of these side effects will be evident from a careful review of the candidate's medical records and a thorough neurological examination. However, specialized testing is necessary to detect the presence of more subtle impairment to neuropsychological functioning, such as lengthened reaction times, decreased memory, decreased concentration, and decreased reasoning ability (Dikmen, 1991). These deficits appear most markedly in tasks that are demanding and require quick responses (Wilder & Schmidt, 1986). While these effects are largely dose-related, numerous studies in the past few years have documented neuropsychiatric effects even at therapeutic levels (Andrewes, 1986; Reynolds & Trimble, 1985; Thompson & Trimble, 1982).

(2) Transient cognitive impairment: A small percentage of patients with epilepsy may have interictal epileptiform EEG discharges which can cause errors in complex tasks such as choice reaction time (Aarts, 1984; Sellden, 1971; Hutt, 1977), signal detection (Tizard & Margerison, 1963; Mirsky & Van Buren, 1965), tracking (Goode, 1970), and short-term memory (Hutt, 1972; Hutt & Gilbert, 1980). Kasteleijn-Nolst Trenite (1987) studied six drivers with epilepsy; he found that during actual driving, three had difficulty with lane control equivalent to the effect of 5-10 mg of diazepam. Whether transient cognitive impairment will occur depends to a large extent on the type, frequency, and duration of the discharges. Generalized spike-wave discharges lasting longer than 3 seconds are of most concern (Braathen, 1988). For example, Goode (1970) found impairments in target tracking in nearly all of these patients. The observed impairment began 1-2 seconds after the spike-wave activity began, and ceased 1-2 seconds before the activity ended.

b. RECOMMENDED EVALUATION PROTOCOL:

The physician must carefully question the candidate regarding all of the relevant aspects of this condition: seizure description and frequency, time of day, auras (type, duration, consistency), precipitating factors, etiology, medication, compliance, side-effects, and interference with occupational or other activities.

Complete record review is essential and should include past drug levels, if applicable. Additionally, the candidate should submit pharmacy and driving records for the past several years. Letters from past employers regarding work performance and seizures on-the-job are also helpful.

If an EEG would provide useful prognostic information, the candidate should submit the results of a recent sleep-deprived EEG. However, the interpretation of the study can vary significantly, depending on the quality of the machine, the skill of the technician, and the training of the physician. To ensure maximum accuracy, the American EEG Society's Committee on Laboratory Accreditation should certify the EEG laboratory, and the reviewer should be board-certified by the American Board of Clinical Neurophysiology.

A complete neurological exam should be performed, including tests for ataxia, incoordination, and nystagmus.

If the candidate is currently well controlled on medication, the following additional work-up is necessary:

- Obtain a serum drug level on the day of the examination.

- The candidate should submit results of a complete neuropsychological evaluation, including an assessment of memory, attention, and psychomotor functioning. (Referral centers for such testing can be obtained from a local university.) A serum drug level must be obtained on the day of testing and should be consistent with the candidate's typical levels.

To be acceptable for full duty without restriction, the candidate should meet all of the following criteria:

NO HISTORY OF SEIZURE TRIGGERED BY STIMULI, WHICH OCCUR DURING ROUTINE DUTIES OR CRITICAL INCIDENTS: Triggers of concern would most commonly be psychological and physical stress, and visual stimuli. If the history is positive, the candidate must be restricted from exposure to the relevant stimuli. Alternatively, the candidate could meet this criterion by demonstrating that medication can prevent these non-random seizures and proving a history of medication compliance.

NO SIGNIFICANT RISK THAT A RANDOM SEIZURE WOULD OCCUR WHILE PERFORMING JOB DUTIES AND RESULT IN A MAJOR INJURY TO OTHERS: The procedure for estimating a candidate's specific risk is described in detail in a preceding section. To determine whether this risk constitutes a significant increase, it should be compared to the baseline risk of new-onset seizures, which is equal to 1/2000 per year (or 1/6000 during a 40-hour week) for persons between the ages of 20-50 with a history of head trauma (Hauser, et. al., 1984).

IF THE CANDIDATE IS ON MEDICATION, THERE ARE NO NEUROLOGICAL OR NEUROPSYCHOLOGICAL DEFICITS THAT COULD SIGNIFICANTLY IMPAIR JOB PERFORMANCE: The physician should discuss the clinical significance of any neuropsychological test abnormalities with the clinician who performed the test before recommending appropriate restrictions.

NO EVIDENCE OF TRANSIENT COGNITIVE IMPAIRMENT: The history should be negative and the current EEG should not have more than occasional bursts of generalized spike and wave activity lasting >3 seconds.

IF CONTINUED COMPLIANCE WITH MEDICATION IS NECESSARY, THE CANDIDATE MUST AGREE TO MAINTAIN COMPLIANCE AND TO ALLOW VERIFICATION BY THE HIRING AGENCY: A written pre-placement contract should specify that the agency's medical department will conduct random therapeutic drugs tests on the candidate after hire, and will periodically review both medical and pharmacy records.

Regardless of medication status, all acceptable candidates who are at risk of seizure recurrence should sign a written agreement specifying that any recurrent seizure will immediately be reported to the hiring agency and that the hiring agency has the right to independently verify this. Verification of seizure status would be best accomplished by review of medical and driving records every 12 months.

3) HEAD TRAUMA WITHOUT HISTORY OF SEIZURE

a. GENERAL CONSIDERATIONS:

Following head trauma, many patients will develop a syndrome that may include headache, vertigo, increased reaction time, decreased concentration, impaired memory, easy fatigability, and irritability. Neither the risk of developing this syndrome nor its severity correlates with the severity of the injury (Russell, 1932; Cartlidge & Shaw, 1981). Symptoms (especially headache) will usually appear within 24 hours after the injury. However, some patients do not experience symptoms until weeks following the trauma. Symptoms usually last for several months, but sometimes continue for a year or more. Occasionally, the syndrome may have a waxing and waning course, with dramatic worsening of symptoms several months after they had subsided to a considerable extent.

Although EEGs have no diagnostic or prognostic value in these patients (MacFlynn, 1984), there are other objective tests that can be used to rule out the presence of the syndrome. If diffuse cerebral dysfunction is present, visual evoked potential (VEP) to light flashes of varying frequency will be abnormal (Ommaya & Gennarelli,

1976). Reaction times will also be prolonged (MacFlynn, 1984). The presence of vertigo can be evaluated with electronystagmography. Auditory evoked potentials are delayed in half of symptomatic patients following injuries with loss of consciousness, and can be used to rule out a residual brain stem disorder (Montgomery, 1984; Noseworthy, 1981).

A separate concern following head trauma with loss of consciousness is the development of seizures. Unlike post-concussional syndrome, this risk is strongly related to the severity of the injury. A recent large study involving civilian injuries found the five-year cumulative incidence of late seizures (i.e. occurring more than 1 week post trauma) to be approximately 0.9%, 1.6%, and 10% following mild, moderate, and severe injuries, respectively (Annegers, 1998). Given the low risks following mild and moderate injuries, concerns regarding seizure risk should be addressed only in cases of severe injury. This was defined in the Annegers study as brain injuries with one or more of the following features: brain contusion (diagnosed on the basis of observation during surgery or focal neurologic symptoms), intracranial hematoma, or loss of consciousness and/or amnesia for more than 24 hours. Among these patients, 6% had a late post-traumatic seizure within the first year; 3.6% seized cumulatively between years 1 through 4.

It is important to note that prophylactic antiepileptic agents have been shown to be of no benefit in post-traumatic patients (Schierhout, 1998). Furthermore, the EEG is not helpful in predicting whether late seizures will occur (see review by Janz, 1989), except in cases of penetrating head injuries in which all patients with anterior temporal or central spike foci experienced post-traumatic seizures (Jabbari, et al., 1986).

(For candidates who have already experienced a late post-traumatic seizure, use the evaluation protocol described in the above section on History of Seizure.)

b. RECOMMENDED EVALUATION PROTOCOL:

Physicians should thoroughly question candidates regarding the severity of the injury, nature of the resulting symptoms, and their duration. A complete neurological exam should be performed, including tests for nystagmus. Record review is very important to establish the severity of the injury and to confirm that there have been no post-traumatic seizures.

GROUP I: ASYMPTOMATIC, HISTORY OF MILD INJURY, AND NORMAL EXAM

The risk of seizure in this group is too low to be considered. The main concern is whether the candidate is at risk of a significant recurrence of post-traumatic symptoms.

Level 1: History of symptoms lasting less than one year

Since it is not uncommon for symptoms to last for up to a year, this candidate is probably at low risk of recurrence if he/she has been asymptomatic for at least a few months.

Level 2: History of symptoms lasting more than one year

Since the majority of patients do not have symptoms lasting this long, concerns regarding recurrence or underlying brain damage are justified. Therefore, requiring a symptom-free period of at least several months would probably not be unreasonable.

The physician may want to consider specialized testing to ensure complete recovery. Depending on the nature of the symptoms, this could include visual evoked potentials, electronystagmography, auditory evoked potentials, and/or neuropsychological testing. Of these tests, the last would be the easiest to interpret on a functional basis.

GROUP II: HISTORY OF MILD INJURY BUT EITHER SYMPTOMATIC OR ABNORMAL EXAM

These candidates should be deferred until the course of their condition is clearly established to be benign and/or any abnormal findings have resolved or been found to be of no clinical significance.

GROUP III: HISTORY OF SEVERE INJURY

Evaluate per above protocol. Risk of seizure would warrant restrictions against patrol work and driving for one year post-trauma.

4) PRIMARY HEADACHE DISORDERS

a) GENERAL CONSIDERATIONS:

Chronic headaches are a common problem. Whether these candidates warrant medical restrictions of patrol officer duties depends on the following considerations:

- Will the psychological stress of patrol officer duties place the candidate at high risk of substantial harm?
- Will the candidate require special accommodation for lost time from work?
- Do the medications used in treatment cause chronic impairment of neuropsychiatric function?

Unfortunately, making an individualized assessment of candidates with this disorder must be based almost exclusively on history. Unlike the evaluation of seizure disorders, there are no risk factors or diagnostic tests that can assist the physician in assessing prognosis. However, a basic understanding of the common chronic headache disorders, aggravating factors, and treatment options can be very helpful.

Common chronic headache disorders:

TENSION HEADACHES: Tension headaches are characterized by mild to moderate head pain without the defining features of migraine (nausea, photophobia, or phonophobia). Based on frequency, tension headaches may be classified as "episodic" if there has been more than 10 lifetime attacks but fewer than 15 per month, or as "chronic" if occurring 15 or more times per month for at least 6 months. Tension headaches can have a major impact on both attendance and effectiveness at work. A recent survey by Schwartz (1998) found that while only 8% of subjects with episodic tension headaches reported lost workdays (mean 9 days per year), 44% reported decreased effectiveness at work, home, or school (mean 5 days per year). Twelve percent of persons with chronic tension headaches reported lost workdays (mean 27 per year) with 47% reporting reduced-effectiveness days (mean 20 days per year).

MIGRAINE HEADACHES: Migraine headaches are usually classified as either "common" or "classical." Both are commonly associated with a wide array of neurological symptoms such as nausea, photophobia, lightheadedness, vertigo, and visual disturbances. In classical migraine, these symptoms occur as an aura before the onset of cephalalgia, typically developing over the course of more than 4 minutes and lasting no more than 60 minutes (Gilman, 1992). In common migraine, there is no aura, and neurological symptoms develop at the same time as the cephalalgia. The classical migraine is characterized by a relatively short

duration (<12 hours), compared with common migraine that can last up to 4 days (Sachs, 1985). Certain patients experience "complicated" migraine disorders that are associated with severe neurological deficits such as prolonged hemiparesis, partial blindness, dysarthria, ataxia, or diplopia (Gilman 1992). As with tension headaches, migraines can have a major impact on both attendance and effectiveness at work. Legg (1997) found that migraine patients missed an average of 2.8 days of work per month and reported to work an average of 6 days per month when their productivity was significantly impaired.

CLUSTER HEADACHES: While there is probably a continuum between tension headaches and migraines, cluster headaches are very distinct syndrome. A typical bout involves 1-3 short-lived attacks of periorbital pain per day over a 4-8 week period. This is followed by a pain-free interval that averages one year. The pain begins without warning, and rapidly reaches high (often excruciating) intensity within 2-15 minutes. Attacks last from 30-120 minutes in 75% of cases. In about 85% of cases, attacks tend to recur at the same times each day for the duration of the bout, with additional attacks occurring randomly (Raskin, 1988). Manzoni (1983) found that many attacks occur during non-working hours, such as around 9:00 p.m. and 1:00 a.m.

Aggravating factors:

While numerous factors have been found to precipitate and aggravate tension headaches and migraines, work as an officer will expose the candidate to the most important factor: emotional stress. The role of emotional stress in contributing to both the frequency and severity of these headaches has been illustrated in four recent studies, two of which were prospective in design (Tekle, 1995; Scharff, 1995; Marlowe, 1998; Labbe, 1997). Scharff (1995) found that over 72% of both migraine and tension headache patients reported that stressful situations sometimes triggered their headaches. Curiously, however, migraines do not tend to occur at the peak of stress, but rather during subsequent relaxation periods (Raskin, 1988).

Short intense bursts of exercise may result in a migraine attack in certain patients (Massey, 1982). Typically, focal neurological symptoms appear immediately following activities such as running or heavy lifting, and are followed several minutes later by nausea and a severe headache (Rooke, 1968). However, conditioning can help reduce the frequency of these headaches in many patients.

Cluster headaches are triggered by precipitating factors in only a small percentage of patients (Raskin, 1988). Paradoxically, vigorous physical exertion at the earliest sign of an attack can be remarkably effective in ameliorating or even aborting an attack in some patients (Atkinson, 1977).

Treatment:

Many of the drugs used to treat the various headache syndromes can impair the neuropsychological functioning of a patrol officer. While determining the impact of

a particular drug on a particular candidate can be difficult, there are certain drugs which are associated with such a high incidence of impairment (primarily sedation) that all users would warrant restrictions against driving and carrying weapons. These include benzodiazapines, barbiturates, antihistamines (except newer non-sedating varieties), codeine, propoxyphene, narcotics, and phenothiazines. Support for this prohibition can be found in medical guidelines for commercial drivers (Booker, 1988). (Note: The above list of medications is not necessarily the best medications for the treatment of headaches. However, they are listed above to present the range of typical medications, which may be used by non-specialists.)

The newest treatment available for acute migraine is sumatriptan, available in injectable, oral, and nasal formulations. This medication can greatly reduce the length of an acute attack and has been shown to significantly reduce lost time and reduced productivity at work (Legg, 1997). Side effects are minimal in severity and transient. Unfortunately, the pill form costs $10-$12 each, and may not be covered by certain health plans.

When migraines occur 2-3 times per month, preventive medication is usually indicated. There are numerous drugs that are available, each of which has a probability of success of about 60% (Raskin, 1988). Although it has not been clearly established that these drugs alter the natural history of the disorder, many patients are able to discontinue medication completely after 6 months and experience fewer and less severe attacks for long periods of time (Diamond, 1982).

b. RECOMMENDED EVALUATION PROTOCOL:

Physicians must thoroughly question candidates with a history of chronic headache to ascertain the severity, frequency, number of days lost from work, associated neurological symptoms, exacerbating factors, and the effectiveness and side-effects of medication.

Review of medical and pharmacy records is strongly recommended. Particular attention should be made to references that indicate the severity of the condition and whether it is aggravated by stress. An inquiry to a past employer regarding lost time due to headaches may be appropriate.

As presented above, medical restrictions should be based on the following considerations:

- <u>THE CANDIDATE WILL REQUIRE MORE THAN THE AMOUNT OF SICK LEAVE ALLOTTED PER YEAR</u>

  This can be determined directly by a review of the candidate's medical records and employment history for the past two years. It is reasonable to assume that this pattern will continue into the near future (i.e., 2 years), with two exceptions. Sick leave may increase if the candidate's headaches are

aggravated by stress (see next consideration). Sick leave may decrease if a candidate with migraines is willing to change to a new medication regimen, which may include prophylactic medications and sumatriptan for acute attacks. In this case, the candidate should be offered a reevaluation after a period of time to determine if sick leave use has improved to acceptable levels.

- THE EMOTIONAL STRESS OF PATROL OFFICER DUTIES WILL PLACE THE CANDIDATE AT A HIGH RISK OF SUBSTANTIAL HARM

  This assessment must be based on a well established past medical history of stress exacerbation in the particular candidate under consideration. Additionally, there should be a past history of severe headache disorder causing prolonged absence from work, disability, or change of job/career. In these cases, the stress of patrol work will likely cause a recurrence of the past disability.

- THERE IS EPISODIC IMPAIRMENT OF NEUROPSYCHIATRIC FUNCTIONING DUE TO SIDE-EFFECTS OF MEDICATION

  As discussed above, use of certain medications is not appropriate for persons such as patrol officers who must make split-second life or death decisions, or whose personal safety (and the safety of others) may be compromised by decreases in vigilance or reaction times. These medications include:

  - benzodiazapines
  - barbiturates
  - antihistamines (except non-sedating varieties)
  - codeine
  - propoxyphene
  - narcotics
  - phenothiazines

An appropriate restriction would specify that the candidate should not drive or be assigned to critical tasks when using these medications. Of course, frequent use would make accommodation very difficult, and the candidate should be evaluated by his/her private physician for alternate therapies.

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RESPIRATORY SYSTEM[1]

I. INTRODUCTION

A. OUTLINE OF HIGHLIGHTED CONDITIONS

1) Obstructive Disease

2) Restrictive Disease

3) Miscellaneous Conditions

B. IMPLICATIONS FOR JOB PERFORMANCE

A pulmonary limitation to exercise may cause serious injury to both the patrol officer and the public in the following situations:

- Running in pursuit of suspects: speed is important in up to 90% of incidents, distances may range up to 500 yards.
- Pursuit followed by physical altercation: subduing combative subjects takes an average of 3 minutes.
- Moving incapacitated persons: ability to lift and carry someone distances of 40+ feet when speed is critical.

The minimum exercise capacity required to perform these tasks can be estimated from published tables of oxygen consumption (Jette, et al., 1990; AMA Committee on Exercise, 1972). These indicate that oxygen consumption at a level of approximately 42 ml O_2/kg/min is necessary to perform activities such as wrestling, running, and extensive lifting at a level of moderate-to-heavy intensity. Since oxygen consumption in a life-or-death struggle certainly could be much greater than 42 ml O_2/kg/min, this value represents a valid minimal level of fitness. Furthermore, this value is reasonable in that it represents the average fitness level of the most common group of arrestees, males <30 years old (Pollock & Schmidt, 1980).

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[1]Author: R. Leonard Goldberg, M.D.
Specialist Review Panel: James R. Dexter, M.D.; Philip Harber, M.D.; William G. Hughson, M.D.

Depending on the location of the hiring agency, the physician also must consider that the above situations may occur during adverse environmental conditions such as:

- High levels of dust, pollutants, or other allergens;
- Cold air;
- High altitude (low oxygen);
- Exposure to toxic substances: This may occur when officers investigate clandestine drug labs or become first responders at toxic spills or fires. Some officers carry mace, which is an upper airways irritant.

II. MEDICAL EXAMINATION AND EVALUATION GUIDELINES

A. GENERAL SCREENING RECOMMENDATIONS

1) History: See Medical History Statement.

2) Examination: All candidates should have a standard auscultatory exam.

3) Routine Testing: A spirogram is highly recommended for all candidates to ensure the veracity of the reported medical history.

In performing the spirogram, attention to detail is important. All technicians must be trained in the proper calibration and administration of the test as specified in the spirometry standards of the American Thoracic Society (Gardner, 1979). To assure reliability, it is recommended that at least three efforts be recorded, and that the FEV1 and FVC values of the best two efforts be within 5% of each other.

The physician should be skilled in the interpretation of spirograms; therefore, a review of a text or articles on this subject is highly recommended (Enright & Hyatt, 1987; Hankinson, 1986). The following considerations deserve special emphasis:

- Caution must be taken to ensure that predicted values are based on correct age, height, and race data before decisions are made. All candidates except for African-Americans should be entered as "Caucasians." If the spirogram does not correct for race, the predicted volumes for African-Americans should be lowered by 10-15%. At the present time, Latinos and Asians are entered as Caucasians. However, the physician should keep in mind that several studies indicate that these groups have predicted values somewhere between African-Americans and Caucasians.

- To both interpret the spirogram and assess compliance, it is helpful to know if the candidate used any medication on the day of the test. A serum level of theophylline on the day of testing is recommended if the candidate has any history of theophylline use.

- Values for the FVC and FEV1 of 80% predicted and an FEV1/FVC ratio of 70% are generally considered to be at the lower end of the normal range. If these volumes are normal, spirometry parameters which measure low-volume flow rates (FEF 25-75, FEF 75) may still indicate small airways obstruction, especially in smokers. However, these measurements have no established relationship to functional exercise capacity and are very unreliable.

- If volumes are below normal, it is important to inquire about respiratory infections over the last six weeks, since these can cause lingering abnormalities.

4) Supplemental Testing Procedures

a. Chest radiographs: These may have some benefit in routine screening of older candidates who have a history of smoking or exposure to asbestos. Otherwise, their use as a routine screening tool in healthy adults has an extremely low yield, and therefore is not recommended. However, the chest radiograph may provide important information in candidates who have chronic pulmonary symptoms without a specific diagnosis or those with restrictive patterns on a screening spirogram.

b. Exercise stress testing (EST): Routine ESTs to assess a potential pulmonary limitation to exercise are not necessary in candidates with no history of pulmonary disease or abnormal spirometry. However, when a pulmonary limitation to exercise is suspected, an EST is an important ancillary tool to help the physician assess the applicant's maximal aerobic capacity.

The gold standard is a complete "pulmonary" EST, which includes continuous measurement of expired-air gas concentrations (Jones, et al., 1988). This test will accurately determine exercise capacity, as well as distinguish between cardiac and pulmonary limitations to exercise. Unfortunately, it is invasive, expensive, and generally only performed by pulmonary specialists.

There are several alternative tests that can be performed; however, while these will not allow differentiation between pulmonary and cardiac limitations to exercise, this is not a significant shortcoming, since the primary purpose of exercise testing of candidates with pulmonary disease is to assess maximum functional capacity, rather than to establish a specific diagnosis.

1. EST with measurement of expired gases: This test has the advantage of direct and accurate measurement of oxygen consumption. Various protocols with treadmills or bicycle ergometers can be used. The main disadvantages are limited availability and cost.

2. Cardiac stress testing: This test is the least expensive and most readily available, but maximum oxygen consumption cannot be measured directly. However, it does correlate highly with duration of exercise (r = .90) if a standard Bruce protocol is used (AMA Committee on Exercise, 1972). Therefore, maximum oxygen consumption may be estimated as follows:

   VO_2 MAX = 2.94 (minutes) + 7.65 for men, or
   2.94 (minutes) + 3.74 for women

   Sources of error which could cause an underestimation of oxygen consumption include obesity and static muscle tension from gripping of siderails. Therefore, candidates who have low exercise capacity should be given the option of obtaining more accurate testing.

3. Field tests: There are a variety of protocols for estimating VO_2 MAX involving timed walking, running, stepping, or bicycling. Some of these tests are as accurate as cardiac stress testing; however, prediction equations vary depending on the age and sex of the population tested. Therefore, the selection of an appropriate field test and prediction equation must be based on the age and sex of the candidate. An excellent review article on the subject was published by Kline, et al. (1987).

c. Methacholine testing: The degree of bronchial responsiveness can be estimated by the administration of a provoking agent, followed by objective measurement of airways obstruction. Methacholine is currently considered the standard provoking agent. Test results are expressed as the minimum concentration necessary to cause a 20% reduction in the FEV1 (PC20). Clinical uses include:

1. Validation of hyper-responsiveness when spirometry is normal;

2. Quantification of severity: Generally, a PC20>20mg/cc is not associated with symptomatic disease. Conversely, a PC20<2mg/cc is frequently associated with symptomatic bronchospasm (Giudice, 1989);

3. Estimation of amount of treatment required; and

4. Measurement of change in responsiveness in order to optimize treatment or to diagnose occupational asthma.

Although, theoretically, this test is very attractive, it has major limitations due to its low sensitivity and specificity (Weiss, 1990). Moreover, the test does not reliably predict 2-3 year prognosis or identify which candidates may develop airways reaction after unprotected chemical exposure. Therefore, for the purposes of assessing patrol officers with asthma, the test must be used cautiously and only in the context of other relevant factors.

B. EVALUATION OF COMMON CLINICAL SYNDROMES

1) OBSTRUCTIVE DISEASE

Candidates with a history of asthma or exercise-induced bronchospasm (EIB) require special consideration. Similarly, the physician must evaluate those who deny a positive history but demonstrate an obstructive pattern on a screening spirogram (FEV1/FVC ratio <70%).

a. GENERAL CONSIDERATIONS:

Obstructive disease can be categorized into two general classes:

- Fixed air flow obstruction:

  Conditions such as emphysema and chronic bronchitis are characterized by a fixed and relatively non-variable degree of air-flow obstruction. Unless there is an intercurrent infection, measurements of lung volumes on a given day are a reliable predictor of volumes on random days. Similarly, lung volumes are only minimally improved with medication, and exercise-induced bronchospasm (EIB) is not common.

  The major consideration in these candidates is their exercise capacity.

- Variable air flow obstruction:

  Asthma is characterized by large variability in lung volumes and clinical symptoms. On any given day, flow rates and volumes reflect combined influences of a multitude of factors such as compliance with medications, atmospheric conditions, exposure to allergens, air pollutant concentrations, and the recency of aerobic exercise. Thus, an in-depth individualized assessment, that includes testing on multiple days and record review, is essential before these candidates are allowed to perform patrol officer duties without restriction.

  Evaluation of these candidates is further complicated by consideration of EIB and medication use:

  Exercise-induced Bronchospasm: EIB commonly occurs in candidates with a known history of asthma and in others who may deny asthma, but who have a history of allergies. EIB can develop either during or immediately after (commonly 5-20 minutes) a period of aerobic exertion, and lasts for at least five minutes. EIB tends to be greater with activities that cause high ventilation rates with cool and dry air. Therefore, running causes more EIB than swimming. Depending on its severity, EIB may limit exercise capacity, thus posing a direct threat to the officer and the public.

The clinical significance of EIB can be assessed by history and/or an EST with pre and post spirograms. Post-exercise spirograms should be conducted at 5, 10, and 20 minute intervals. A decrease in FEV1 of more than 10% compared to the baseline is abnormal (Jones, et al., 1988). However, clinical significance depends on the absolute value of the FEV1, auscultatory findings, and symptoms. The primary concern is whether the candidate could reinitiate and sustain an exercise level requiring 42 ml O_2/kg/min at the time of peak bronchoconstriction.

Use of medication: Individuals with asthma who use medication can be separated into two broad categories:

1. Candidates who require pre-exercise medication to prevent EIB: Patrol officers must be capable of maximal exertion without warning. Consequently, the use of pre-exercise medication cannot be accommodated.

2. Candidates who use only regularly scheduled medication with no p.r.n. use before or after exercise: In these cases, the candidate's past compliance with the prescribed medical regimen and the effectiveness of this regimen are the major determinants of fitness for duty.

b. RECOMMENDED EVALUATION PROTOCOL:

Candidates with a positive history of obstructive disease, EIB, or abnormal spirometry should be carefully interviewed. Specific inquiries should include:

- Has there been any interference with routine exercise/activities in the last two years due to this condition?

- What type, intensity, and duration of exercise causes EIB? Is pre-medication used?

- If medication use is denied, be sure to ask about OTCs or use of a "friend's inhaler."

- Do symptoms only occur with concurrent infections? If so, how often do these infections occur?

- Has the candidate had to obtain unscheduled medical evaluations in the past two years?

- Has the candidate's condition required an increase in the dosage or number of medications in the past two years?

Review of relevant medical and pharmacy records for the past two years is highly recommended.

GROUP I: OBSTRUCTIVE PATTERN ON SPIROGRAM BUT NEGATIVE HISTORY OF OBSTRUCTIVE DISEASE, EIB, OR MEDICATION USE IN THE LAST 10 YEARS

Level 1: FEV1/FVC 50-69%

These candidates should undergo an EST with pre/post spirograms. A recommendation for unrestricted duty should be based on a reliable history and the ability to complete an acceptable level of exercise without clinically significant EIB. Note: If the physician has reason to doubt a benign history in these candidates, a methacholine test could provide enough ancillary evidence to warrant further investigation by the hiring agency.

Level 2: FEV1/FVC <50%

It is highly probable that obstruction of this degree will prevent sustained pursuits or survival in a subsequent altercation. Therefore, restrict from these types of job duties.

GROUP II: ADMITS TO A POSITIVE HISTORY OF OBSTRUCTIVE DISEASE, EIB, OR MEDICATION USE IN LAST 10 YEARS

The physician should carefully assess the variability of the candidate's disease, and the need for pre/post-exercise medication during the past two years. Evidence consistent with clinically significant variability would include:

- Use of non-inhaled steroids;
- Need for unscheduled medical care for pulmonary symptoms;
- An increase in the dosage or the number of therapeutic drugs (Note: Substitution of one drug for another may be due to changes in prescribing practice rather than the candidate's condition);
- Impairment in occupational or recreational activities;
- More than minor symptoms;
- Variability in the measured FEV1 of >10% when the FEV1/FVC ratio is below 70%.

Level 1: Stable disease with no use of pre/post-exercise medication during the past two years

Obtain an EST with pre/post spirograms. In general, no restrictions are necessary if the candidate is able to complete an acceptable level of exercise without clinically significant EIB, and the physician believes that an acceptable level of functioning can be maintained during the vast majority of workdays within the next 2-3 years. For certain hiring agencies, the physician may have to consider whether the candidate will be able to maintain adequate functioning when exposed to severe environmental/toxic conditions.

Note: In borderline cases, the physician may consider obtaining a methacholine challenge test or requiring weekly spirometry for a period of time.

Level 2: Variable disease or need for pre/post-exercise medication during past two years

In general, EST testing is unreliable in these candidates. Clinically significant variability makes functional assessment on any given day unrepresentative. Similarly, due to the difficulty in detecting whether a candidate has surreptitiously used an inhaler before a scheduled EST, it is often not possible to reliably predict the severity of EIB in situations where intense and sustained exercise is required without warning. Given these limitations, the physician will have difficulty certifying that the candidate could sustain a pursuit or survive a subsequent altercation.

Note: Candidates who are restricted should be advised that they can be re-evaluated at a future time if their condition improves, either with or without medication. However, physicians should require that candidates demonstrate that any such improvement is not temporary. Special caution is needed if a candidate begins using regularly scheduled medications in lieu of p.r.n. pre-exercise treatment, since this regimen is more difficult and expensive for the candidate. Therefore, before recommending that these candidates may work without restrictions, the physician may want to confirm compliance by reviewing pharmacy records over a period of time. Moreover, without unnecessarily revealing the diagnosis to unauthorized individuals, the physician should advise the hiring agency that continued surveillance of pharmacy records is needed to ensure the candidate's fitness for work. The hiring agency may then wish to require the candidate to sign a pre-employment accommodation contract which gives the physician periodic access to pharmacy records.

2) RESTRICTIVE DISEASE

a. GENERAL CONSIDERATIONS:

Physicians should give special consideration to candidates with a history of a connective tissue disease, interstitial lung disease, scoliosis, or chest wall abnormality capable of causing a restrictive pulmonary defect. The physician should also evaluate those who deny a positive history, but who demonstrate a restrictive pattern on a screening spirogram (FVC <80% predicted with normal FEV1/FVC ratio).

Fortunately, the prevalence of restrictive disease is low. However, technical errors which can cause minor underestimations of the FVC are common. If the history is negative, the physician should carefully inspect all restrictive spirograms for the following before recommending further evaluation:

- Does the tracing show smooth curves with reproducible measurements of the FVC?
- Do volume-time curves plateau for at least one second at the end of the effort?
- Is the predicted FVC volume based on the correct age, height, and race data?

b. RECOMMENDED EVALUATION PROTOCOL:

GROUP I: FVC <80% PREDICTED DUE TO OBVIOUS CHEST WALL ABNORMALITY

Obtain an EST to assess exercise capacity. If acceptable, see Musculoskeletal chapter.

GROUP II: FVC <80% PREDICTED, POSITIVE HISTORY, OR POSITIVE PHYSICAL EXAM THAT IS NOT DUE TO OBVIOUS CHEST WALL ABNORMALITY

Request an evaluation by a pulmonologist that includes a chest radiograph and complete pulmonary function testing to measure total lung capacity and diffusion capacity.

Level 1: Normal vital capacity, diffusing capacity, and chest radiograph

Capable of full duty, no work restrictions necessary.

Level 2: No evidence of interstitial disease since diffusing capacity and chest radiograph are normal, but restrictive pattern confirmed by low vital capacity

Request an EST that includes expired gas analysis and oximetry. A full duty recommendation should be based on the attainment of an oxygen consumption level of at least 42 ml O_2/kg/min without oxygen saturation falling below 90%. The latter would indicate inadequate oxygenation of the tissues which would impair sustained efforts.

Level 3: Specific disease diagnosed

Base final recommendation on an assessment of current functional ability (see Level 2), consideration of the 2-3 year prognosis for significant progression, and the clinical significance of non-pulmonary manifestations.

3) MISCELLANEOUS CONDITIONS

There are many other less common respiratory conditions that require special evaluation. These conditions require careful consideration of the nature, severity, duration, and likelihood of impairment associated with the condition and the demands and conditions of the job. The example below involving spontaneous pneumothorax, is intended to illustrate ways in which job-related issues should be considered when determining a candidate's ability to perform the essential duties of the job.

a. GENERAL CONSIDERATIONS:

Spontaneous pneumothorax (SP) can cause sudden or insidious impairment. Sudden chest pain and dyspnea have been found to occur in 85% of cases (Klassen & Meckstroth, 1962); total incapacitation has been found in 18% of cases (Voge & Anthracite, 1986). Moderate to severe distress is apparent in approximately one-third of SPs (O'Hara, 1978). Most patients treated conservatively (e.g., chest tube suction) will have a recurrence within one year (Voge & Anthracite, 1986).

Several personal variables have also been found to affect the likelihood of SP recurrence. Smokers are about 10 times more likely to develop SP relative to non-smokers (Bense, et al., 1985). In addition, incidents of SP are greater in males than females, due largely to their increased height, causing greater traction on apical blebs (Melton, et al., 1981).

Patients suffering from SPs often delay in seeking treatment. Greater than 50% of those with even moderate to severe symptoms often delay seeking treatment for hours or days (Voge & Anthracite, 1986). This behavior, similar to that commonly observed in patients who suffer heart attacks, suggests that an officer suffering an SP may remain on duty despite impairment, thereby increasing the likelihood of being involved in a critical, physically demanding incident while suffering from an SP. (Note: there is no association between exercise and recurrence of SP.)

b. RECOMMENDED EVALUATION PROTOCOL:

Medical records should be reviewed and the date and subsequent treatment of each SP should be documented.

In general, candidates should be restricted from field duties if they have had an SP within the last year that was treated conservatively. However, the physician should consider the number of SPs experienced by the candidate in the past, as well as the individual's smoking history and height, before making the final recommendation.

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VISION GUIDELINES[1]

I. INTRODUCTION

These guidelines serve as an update to the 1985 POST Vision Screening Guidelines. Although both editions address many of the same visual acuity issues, this update provides a more in-depth, literature-based approach to the evaluation of visual function, consistent with the type of guidance found throughout the rest of the Medical Screening Manual. This additional depth and detail is intended to enable physicians and hiring authorities to establish vision standards that are fair and consistent, and to allow for the individualized consideration of agency and candidate specifics.

A. PRE-EMPLOYMENT VISION SCREENING AND THE LAW

The importance of vision to the safety of the officer and the public is undisputed, yet pre-employment vision standards have been the subject of many legal challenges. Most commonly, agency vision standards have been assailed for: (1) lack of proven job relatedness; (2) failure to allow for reasonable accommodation; (3) inconsistency in standards across agencies; and (4) inconsistent enforcement of standards within an agency, particularly with respect to candidates versus incumbents.

1) Insufficient Job Relatedness. Not uncommonly, an agency's selection of vision standards is based on unsubstantiated suppositions rather than on research demonstrating job relatedness. The vision guidelines presented here are supported by detailed, quantitative summaries of the currently available literature. However, it is incumbent upon each agency to review these summaries as carefully as the guidelines themselves to ensure that the assumptions and findings are applicable to the job duties and circumstances in its jurisdiction.

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[1]Authors: R. Leonard Goldberg, M.D. (City of Los Angeles); Shelley Weiss Spilberg, Ph.D. (POST)
Specialist Review Panel: Ian Bailey, O.D.; James Bailey, O.D.; Michael Gordon, M.D.; Chris Johnson, Ph.D.; James Sheedy, O.D.; Stephen G. Weyers, M.D.

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Note: These guidelines reflect the combined input of the vision expert panel; however, the viewpoints of individual panelists are not in all cases identical to the positions described herein.

2) Failure to Allow for Reasonable Accommodation. Another frequently adjudicated agency vision policy is the unilateral prohibition against the use of a visual correction device or procedure to accommodate poor visual acuity (e.g., glasses, contact lenses, radial keratotomy). Findings in favor of the candidate in these cases are not uncommon when the agency appears to have based its policy on unfounded concerns rather than factual evidence. Included in this section is a detailed discussion of the advantages and risks associated with each method of visual correction, along with guidance on how to use this information to make appropriate employment decisions.

3) Inconsistency in Vision Standards Across Agencies. While patrol officers across the state share many essential job functions, differences in job demands and environmental conditions do exist across agencies. Thus, the risk posed by an officer with decreased visual function (or the hardship caused by accommodating such individuals) may also vary across agencies. Throughout this section, the impact of site-specific factors are discussed to enable each jurisdiction to create vision standards that are appropriate for its specific agency.

4) Inconsistent Enforcement of Agency Standards. An agency's allegation that its vision standards are job-related is weakened if incumbent officers who no longer meet these standards are successfully performing the job. While at times judges have agreed with law enforcement agency assertions that experience can partially compensate for visual impairment (e.g., Padilla v. City of Topeka, 1985), other courts have ruled against law enforcement agencies who maintain stringent vision standards for applicants while failing to enforce these standards among its incumbent officers (e.g., Brown County v. LIRC, 1985). However, the stability of most visual functions makes this double standard issue largely moot. Except for near vision, the visual acuity of the vast majority of persons remains fairly stable with age. As evidence, the results of uncorrected vision testing among incumbents of the Los Angeles City Fire Department (Goldberg & Bible, 1993) showed that, after an average of 11 years of service, over 96% of the 1,111 firefighters tested still possessed uncorrected vision that met the pre-placement guideline of 20/40. Even in the class of Captain II, about 90% of the 164 incumbents still had 20/40 vision after an average of 23 years of service.

In summary, the intent of the research presented in this chapter is to enable agencies to develop reasonable vision standards which can both minimize safety risks and fair employment liability.

B. OUTLINE OF HIGHLIGHTED CONDITIONS

1) Far Acuity Deficiency

   - Use of glasses
   - Use of contact lenses
   - Use of orthokeratology

2) Radial Keratotomy

3) Visual Field Deficiency

4) Binocular Fusion Deficiency

5) Color Vision Deficiency

A summary of the recommended evaluation criteria presented in this chapter begins on page XI-57.

C. IMPLICATIONS FOR JOB PERFORMANCE

In 1984, POST conducted a vision-oriented job analysis for the position of patrol officer (Briggs, 1984). After interviewing and observing officers in the field, a panel of vision experts developed a list of 17 relevant visual skills. The importance of these skills for patrol officer performance was then rated by 158 incumbent officers (average patrol experience = 5 years) who had been shown slides depicting and illustrating each of the 17 visual skills. The officers were also asked to provide detailed accounts of actual critical incidents based on their personal experiences. The officers produced a total of 1,291 incidents which involved at least one of the 17 visual skills. The results from both activities are reported in Table XI-1.

As indicated in Table XI-1, the officers rated dark adaptation as the most important visual skill, followed by peripheral vision. However, no skill was rated less than "important." The ability to identify objects was involved in the highest percentage of critical incidents (24.9%), followed by visual pursuit (21.1%), motion detection (17.9%), dynamic far acuity (15.6%), dark adaptation (15.5%), and peripheral vision (11.2%).

The usefulness of these results for establishing quantitative screening guidelines is limited by the large number of visual skills assessed, their interdependency, and (for many of the skills) the unavailability of practical tests for their measurement. Nonetheless, these results confirm the importance of virtually every visual capability in the safe performance of patrol officer duties.

TABLE XI-1
Patrol Officer Importance Ratings of 17 Visual Skills (N = 158)

Visual Skill	$\bar{X}$ Importance Rating*	% of the 1,291 Critical Incidents in Which Skill Was Involved
Dark Adaptation	4.50	15.5%
Peripheral Vision	4.34	11.2
Identify Objects	4.29	24.9
Motion Detection	4.13	17.9
Fine Details/Various Light Levels	4.03	9.1
Pursuit	3.95	21.1
Dynamic Near Acuity	3.93	2.5
Accommodation	3.87	4.3
Dynamic Far Acuity	3.81	15.6
Depth Perception	3.68	6.8
Light Adaptation	3.63	3.3
Glare Recovery	3.61	1.1
Glare Tolerance	3.59	9.8
Identify Large Forms	3.54	1.1
Static Far Acuity	3.54	3.8
Color Identification	3.53	5.8
Color Discrimination	3.30	1.2

*Rating scale values: 5 = critically important, 4 = very important, 3 = important, 2 = of some importance, 1 = of little importance

From Briggs, R. 1984. Visual skills job analysis and automated vision testing. Unpublished technical report for the Commission on Peace Officer Standards and Training.

II. MEDICAL EXAMINATION AND EVALUATION GUIDELINES

A. GENERAL SCREENING RECOMMENDATIONS

1) History:

All candidates should be questioned regarding use of glasses or contact lenses, visual loss, night blindness, refractive surgery and eye diseases (see Appendix C - Medical History Statement, Form #2-252).

2) Routine Testing:

a. FAR ACUITY

It is very important to use standardized charts and methods when measuring visual acuity. Non-standardized testing results in erroneous measurements and increased measurement variability.

Far acuity testing procedures:

1. Use only charts which meet ANSI Z80.21 (1992). To date, the Bailey-Lovie chart and the ETDRS chart meet this standard (Ferris, et al., 1982).

2. The chart should have relatively even luminance (brightness) across its surface - luminance should be 160 cd/m^2, with an acceptable range between 80-320 cd/m^2.[2] This brightness can be accomplished by placing the chart immediately next to a window with moderately filtered light (e.g., arranging blinds so that direct sun does not hit the chart). Make sure that the candidate is not looking towards a window with direct sunlight that serves as a source of glare. In an otherwise darkened room, a 100-watt light bulb in an auxiliary lamp holder at about 2.5 feet from the chart will also provide this luminance level. Most fluorescent lit rooms, unless they are highly lit, will require some auxiliary lighting to accomplish 160 cd/m^2.

3. Testing should be performed with the candidate at a distance of 20 feet from the chart. If the candidate is unable to discern the top row of letters at this distance, testing should be performed at 10 feet and the measurements adjusted appropriately (e.g., reading the 20/40 line at 10 feet is equivalent to 20/80).

4. Monocular testing should precede binocular testing.

5. Uncorrected acuities should be measured before corrected acuities.

6. The candidate's eyes should be carefully inspected to ensure that contact lenses are not worn during uncorrected testing.

7. An occluder should be used by the candidate on one eye while testing the other eye. The candidate can hold the occluder. The occluder can simply be an index card.

8. Candidates should be informed that they may not squint during the testing. The tester should observe the candidate to ensure compliance.

9. Candidates should read at least one acuity line in which they can identify all 5 letters. They should proceed to successively smaller acuity lines until they are unable to identify any letters on a line. They should be encouraged to guess when letter recognition becomes difficult.

10. Candidates should be given credit for each letter properly identified. The best method of scoring is to record the number of letters properly identified on each line attempted.

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[2] This is equivalent to 25-100 foot-candles.

11. Visual acuity is scored by identifying the acuity line which was closest to being properly identified, and including a +/- notation to more precisely convey the number of letters properly identified. For example, if the candidate properly read the entire 20/30 line and one additional letter on the 20/25 line, the score would be 20/30+1. Identifying all of the 20/30 line and 3 of the 5 letters on the 20/25 line would result in a score of 20/25-2. Since the charts mentioned above have 5 letters per acuity line, the +/- value will never exceed a value of 2.

12. In scoring visual acuity, letters which are properly identified on a smaller line compensate for letters missed on a larger line. For example, if a candidate reads 4 out of 5 letters on the 20/30 line, and 2 of 5 on the 20/25 line, the score would be 20/30+1.

13. Measured acuity should meet or exceed the agency standard. For example, if a standard has been set at 20/40 then the measured acuity must be 20/40 or better (20/40-1 does not meet the standard).

b. COLOR VISION

A pseudoisochromatic plate (PIP) test should be administered to all candidates.

It is crucial that the test be administered under proper illumination conditions. All color vision tests are designed to be used with a standard source of illumination, one approximating standard illumination "C" of the CIE (International Commission on Illumination). Neither daylight nor incandescent lighting should be used. The standard illuminant should be the only source of illumination. However, illumination provided by ordinary daylight fluorescent lamps (15-watt type, providing 25 foot-candles of illumination) is a minimum substitute for CIE standard daylight with the Ishihara PIP plates. Better options include Hi-Lite fluorescent bulbs, the True Daylight Illuminator (available through Richmond Products), and the Verilux True Color Light fluorescent tube (F15T8VLK), available from Verilux Incorporated. A recent study by the Federal Aviation Administration (Milburn & Mertens, 1993) demonstrated that the inexpensive Verilux tube is an effective substitute for the now unavailable Macbeth Easel Lamp.

Tinted lenses effectively alter the standard illumination required for all color vision tests, thereby invalidating the results. Therefore, use of colored contact lenses (such as the X-Chrom) or tinted spectacle lenses should not be permitted for color vision tests.

Before administering the test, make sure that the candidate, test, and illuminant are properly positioned. The candidate should be seated a distance of 75 cm. (about 30 inches) from the test. The PIP plates should be supported and then tilted until they are perpendicular to the candidate's line of sight. The illuminant should be situated so that the illumination is direct and even,

and is incident approximately at an angle of 45° to the plates. It is desirable to have a small paint brush available for use as a pointer or for tracing symbols, numbers, or winding paths on the plates.

Before beginning, explain the testing procedures to the candidate; for example: "I am going to show you some colored numbers in this book. On each plate, you will see a one or two digit number, or none. Tell me what you see. If you are not sure, use the paint brush to trace over it."

Testing should begin with the presentation of the demonstration plates. If the candidate cannot read the demonstration plates, discontinue the test.

Present the remaining plates in steady, rapid succession. No more that 3-5 seconds should be allowed for a response to each plate.

Mark the plates which were read incorrectly on the score sheet and then determine if the total number of test errors exceeds the pass-fail standard established by the test publisher.

c. BINOCULAR VISION - STEREOPSIS

All candidates should be administered a binocular vision test. Candidates should be tested while wearing their visual correction (e.g., glasses, contact lenses). There are several satisfactory commercial tests available, such as the Titmus Industrial Screener, that are relatively inexpensive, easy to use, and readily available.

3) Examination:

Routine physical examination of the eyes is discussed in Chapter IX - Neurology. However, during the examination of the cornea, special attention should be given to detecting radial keratotomy incisions. In most cases, incisions can be readily detected using the +20 lens of the ophthalmoscope (black numbers) to focus on the cornea.

B. EVALUATION OF COMMON CLINICAL SYNDROMES

1) FAR ACUITY DEFICIENCY

a. GENERAL CONSIDERATIONS

Various methods have been used to determine the impact of far acuity deficiencies on performance as a patrol officer. The critical patrol officer functions studied include: (1) deciding whether to discharge a firearm; (2) facial recognition; and (3) license plate identification.

1. "Shoot-No-Shoot" Decisions: Deciding whether to discharge a firearm is one of the most critical tasks facing patrol officers. Unfortunately, in a number of jurisdictions, making this decision is not all that infrequent. For example, in 1986, approximately 1 out of 50 LAPD sworn officers discharged their weapon; 42% of these incidents resulted in a civilian being wounded or killed (Pate & Hamilton, 1991). Since this study included officers who do not work in the field, the firearm discharge rate among officers assigned to field duty would be expected to be higher.

   A separate study of LAPD officer-initiated shootings during 1990-92 found that over 30% of the 519 incidents occurring during this period involved shooting at targets over 25 feet away. Moreover, 65% of officer-initiated shootings took place at night or at dawn/dusk (Spilberg, 1993).

   An officer's ability to rapidly determine whether a suspect in the distance is holding a weapon is typically studied by using decorrection lenses in scenarios at distances varying from 7-25 yards. In a 1981 study by Giannoni, six California Highway Patrol (CHP) officers with 20/20 or better uncorrected vision were sequentially decorrected to 20/40, 20/80, and 20/200. During each visual condition, the officers were asked to identify whether a "suspect" was holding a gun or a comb at distances of 7, 15, and 25 yards. No errors were made with 20/20 vision, even at a distance of 25 yards (Table XI-2). With 20/40 vision, the officers correctly identified all of the objects at 7 yards, but misidentified 14% at 15 yards. With 20/80 vision, officers misidentified 8% of the objects at 7 yards and 22% of the objects at 15 yards.

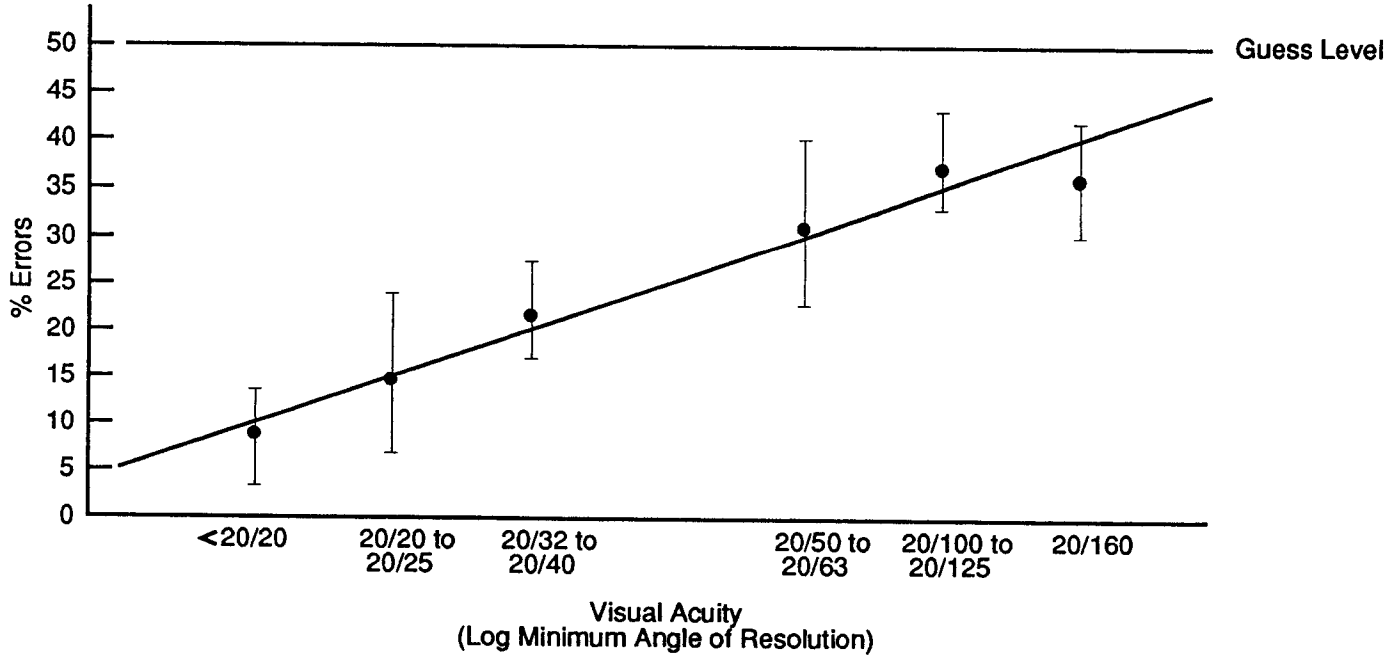
   Good and Augsburger (1987) decorrected 50 patrol officers from Columbus, Ohio who had 20/20 vision or better and then asked them to identify whether a life-size target 20 feet away was holding a firearm. To simulate night conditions (when most shootings in Columbus were found to occur) the trials were conducted under low-light conditions (10 cd/m^2), making them more challenging than those used by Giannoni. This resulted in a task that was moderately difficult, even without decorrection. The officers participating in this study misidentified 5-15% of the 60 targets presented without decorrection (Figure XI-1). With vision between 20/30 - 20/40, the error rate increased to 15-25%. At 20/50 - 20/60, the error rate increased to 25-40%.

TABLE XI-2
Percentage Correct Identifications for "Shoot" and "No Shoot" Scenario

Candidates	25 Yard Distance				15 Yard Distance				7 Yard Distance				Combined Distances			
	20/20	20/40	20/80	20/200	20/20	20/40	20/80	20/200	20/20	20/40	20/80	20/200	20/20	20/40	20/80	20/200
Cell B																
1	100	50.0	50.0	50.0	100	50.0	50.0	50.0	100	100	50.0	50.0	100	66.7	50.0	50.0
2	100	50.0	50.0	66.7	100	83.3	50.0	66.7	100	100	100.0	100.0	100	77.8	66.7	77.8
3	100	100.0	50.0	50.0	100	83.3	83.3	66.7	100	100	100.0	66.7	100	94.4	77.8	61.1
Cell A																
4	100	100.0	16.7	50.0	100	100.0	83.3	83.3	100	100	100.0	100.0	100	100.0	66.7	77.8
5	100	100.0	83.3	50.0	100	100.0	100.0	66.7	100	100	100.0	83.3	100	100.0	94.4	66.7
6	100	100.0	50.0	33.3	100	100.0	100.0	33.3	100	100	100.0	100.0	100	100.0	83.3	55.5
Average	100	83.3	50.0	50.0	100	86.1	77.8	61.1	100	100	91.7	83.3	100	89.8	73.2	64.8

From Giannoni, B. Entry-level vision requirements validation study. Personnel Bureau, California Highway Patrol. October 1981.

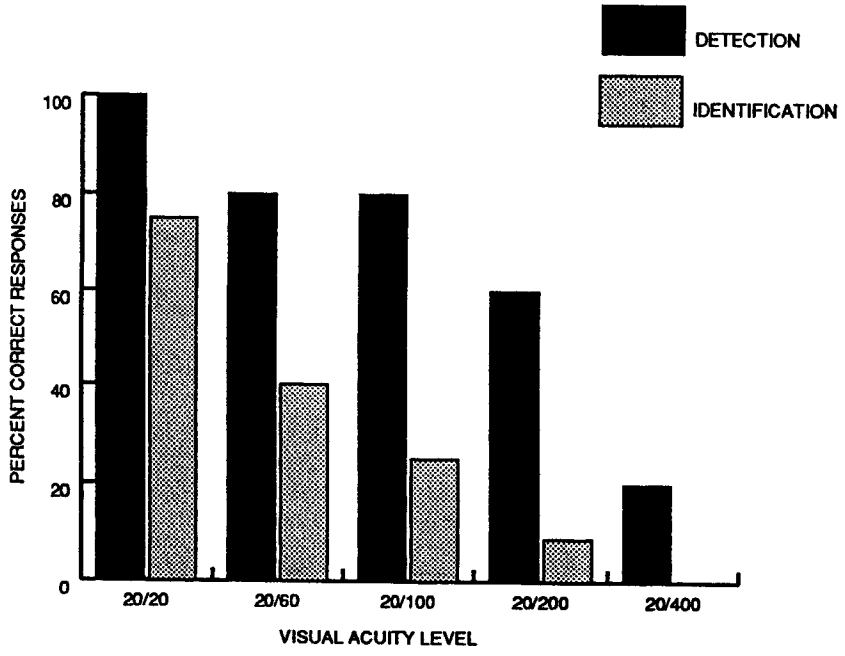
FIGURE XI-1
"Shoot-No-Shoot" Error Rates of Police Officers Tested at 20 Feet in Dim Light (N=60)



From Good, G.W. and Augsburger, A.R. 1987. Uncorrected visual acuity standards for police applicants. J Police Sci Admin. 15(1):18-23.

A third study involving weapon identification was conducted by Johnson and Brintz (1993) who decorrected six supervisors and counselors (with vision of 20/20 or better) from the California Youth Authority. The simulation was conducted under night lighting (5 to 7 cd/m^2) in an open dormitory setting. Fifteen surrogate wards were situated 5-7 feet away from the participants. In each trial, one ward was holding either a weapon (knife or screwdriver) or a non-weapon (toothbrush or comb). The participants were tasked with detecting which ward was holding an object, and identifying whether the object was a weapon or non-weapon. At 20/20 visual acuity, there was 100% correct detection of the ward holding the object (Figure XI-2). Detection fell to 80% correct for the 20/60 and 20/100 acuity levels, 60% at the 20/200 level, and 20% at the 20/400 level. The ability to identify objects declined more rapidly with reductions in visual acuity. Correct identification at the 20/20 level was 75%, which degraded to 40% at 20/60, 25% at 20/100, less than 10% at 20/200, and 0% at 10/400.

FIGURE XI-2
Average Correct Responses for Object Detection and Weapon Identification as a Function of Visual Acuity.



From Johnson, C.A. and Brintz, N. 1993. Entry Level Vision Standards for Group Supervisors and Youth Counselors (draft). Sacramento: California Dept. of Youth Authority.

2. Facial Recognition: The recognition of a face or facial expression from a distance is critically important to the safety of a patrol officer. When pursuing or trying to recognize a suspect in a crowded area, only the suspect's face may be visible. Recognizing and recalling facial features is also important when identifying a suspect in a line-up or when testifying in court.[3]

   Sheedy (1980) performed a self-assessment to determine the acuity level required for face and feature detection. At night, he viewed an illuminated, familiar person from 20 feet while using decorrection lenses. Visual acuity of 20/30 enabled identification, while 20/40 visual acuity resulted in questionable identification. At 20/50, the subject's face became homogeneous and unidentifiable. The results of this study have been confirmed by Bullimore, et al. (1991), who investigated individuals with normal and reduced visual acuity. They observed a high correlation ($r = .87$) between letter chart acuity and the ability of individuals to correctly identify both individual faces and facial expressions associated with various emotional states (Table XI-3).

TABLE XI-3
Recognition of Faces and Facial Expressions as a Function of Visual Acuity

Visual Acuity	Distance at which 50% of faces and expressions can be identified in good illumination (100 cd/m^2)
20/20	14.0 yd.
20/30	8.3 yd.
20/40	5.9 yd.
20/50	4.4 yd.
20/80	2.5 yd.
20/200	0.7 yd.

From Bullimore, M.A., Bailey, I.L. and Wacker, R.T. 1991. Face recognition in age-related maculopathy. Invest Ophthalmol Vis Sci. 32:2020-2029.

[3]As with the other visual tasks discussed above, facial recognition at a distance or in poor illumination can be affected by numerous factors in addition to visual ability per se; for example, race (whites have difficulty identifying black faces; blacks recognize white and black faces equally well [Cross, et al., 1971]), age (less errors with subjects of same age [Mason, 1986], and gender (less errors with subjects of same gender [Ellis, et al., 1973]).

3. License Plate Identification: The ability to read and identify license plate numbers from a distance is another essential job function for patrol officers. For example, when in pursuit of a vehicle at 60 mph, maintenance of a safe distance (i.e., 6 car lengths) requires that the officer read the plate from a distance of 100 feet. Sheedy (1980) found that reading a license plate from this distance required 20/20 vision and good lighting conditions. By extrapolation, someone with 20/40 vision would be unable to read a license plate located more than 50 feet (3 car lengths) away (see Table XI-4). Sheedy noted that these distances assume no movement; under dynamic conditions, viewing distances would be even shorter.

SUMMARY: As Table XI-4 indicates, unimpaired visual acuity is required for many critical patrol officer duties that involve the quick identification of objects at varying distances. Therefore, **20/20 vision can be considered a justifiable qualification standard for patrol officers, assuming that their job duties include facial recognition, firing weapons at distant targets, or driving.** The need for unimpaired vision is even more compelling for officers who may be called upon to perform these duties at night. Johnson, et al. (1992) found that 20/20 vision is degraded to 20/60 under typical night lighting conditions (i.e., sodium vapor street lights); similarly, 20/60 vision is degraded to 20/200.

b. FAR ACUITY STANDARDS FOR EACH EYE VS. BOTH EYES

Although substantial evidence exists to support a stringent far acuity standard for patrol officers, separate issues must be addressed before deciding what standard should be applied to each eye separately vs. both eyes together. In order to justify an "each eye" standard, it must be shown that poor acuity in the weaker eye could have an adverse impact on the safe performance of patrol officer functions. Of relevance here is the likelihood that an officer's better eye would be temporarily unavailable or inoperative, such as in the following two situations:

Sighting around a barrier. Poor vision in one eye could force an officer to protrude his/her head beyond a barrier several centimeters further than would otherwise be necessary to make an observation. Theoretically, this could increase the risk of harm to the officer. However, each agency must evaluate how their officers actually peer around corners and other barriers to determine if this can be used as a basis for establishing a vision standard for each eye.

Trauma to one eye with sudden loss of vision. If there is a significant risk of an officer losing vision in one eye during a critical incident due to sudden trauma, a minimum far acuity requirement for both eyes would be justified. A recent review of LAPD worker's compensation records for the years 1987-1990 revealed that unilateral eye injuries during altercations occurred at an annual rate of approximately 1 per 300 officers assigned to field duty (Goldberg, 1993). Assuming that these injuries would completely impair vision in one eye, the risk of a functionally monocular LAPD officer losing the sight in his/her good eye during an altercation would be approximately 1/600 per year.

TABLE XI-4
Critical Task Performance vs. Far Acuity as Determined by Decorrection Studies.

VISUAL ACUITY	CRITICAL TASK PERFORMANCE
20/20	• In good light, can consistently identify weapons at distances of up to 25 yards[1] • In low light, will identify weapons correctly at 7 yards with an error rate of 5-15%[2] • Under night conditions, from 5-7 feet can detect whether an individual is holding an object with 100% accuracy and can identify object with 75% accuracy[3] • Facial identification with 50% accuracy at 14 yards[4] • License plate identification at 100 feet or 6 car lengths[5]
20/30	• "Reliable" facial identification at 7 yards; 50% accuracy at 8 yards[4]
20/40	• In good light, can consistently identify weapons at 7 yards, but error rate of 14% at 15 yards[1] • In low light, can identify weapons at 7 yards with an error rate of 25%[2] • Legal limit for driving any vehicle • License plate identification at 50 feet (3 car lengths)[5] • Facial identification is "questionable" at 7 yards; 50% accuracy at 6 yards[4]
20/50	• In low light, will misidentify weapons at 7 yards with an average error rate of >25%[2] • Cannot legally drive • Faces are "homogeneous" at 7 yards; 50% accuracy at 4.4 yards[4]
20/60	• Under night conditions, from 5-7 feet can detect whether an individual is holding an object with 80% accuracy and can identify object with 40% accuracy[3]
20/80	• In good light, can identify weapons at 7 yards with error rate of 8%; 22% error at 15 yards[1] • In low light, will misidentify weapons at 7 yards with an average error rate of >30%[2] • Facial identification possible with 50% accuracy only at 2.5 yards[4] • License plate identification at 25 feet[5]
20/100	• Under night conditions, from 5-7 feet, can detect whether an individual is holding an object with 80% accuracy and can identify object with 25% accuracy[3]
20/200	• In good light, can identify weapons at 7 yards with error rate of 17%; 39% error at 15 yards[1] • In low light, identifying weapons at 7 yards will be no better than guessing[2] • Under night conditions, from 5-7 feet, can detect whether an individual is holding an object with 60% accuracy and can identify object with less than 10% accuracy[3] • Facial identification is impossible beyond an arm's length[4] • License plate identification impossible at >10 feet[5] • Legal blindness as defined by the Social Security Administration and the IRS

[1]Giannoni, 1981
[2]Good & Augsbuger, 1987
[3]Johnson & Brintz, 1993
[4]Bullimore, et al., 1991
[5]Sheedy, 1980

The uncertainty and low likelihoods associated with these situations do not lend strong support for a far acuity requirement for the weaker eye based solely on concerns about temporary loss of vision in the stronger eye. However, a certain degree of vision in each eye is necessary for adequate peripheral vision (discussed in section 3), and especially for binocular fusion and stereopsis (discussed in section 4). Adoption of the guidelines discussed in these sections will serve to ensure adequate visual acuity in the weaker eye.

c. METHODS OF CORRECTION

Although good far acuity has been shown to be essential for the safe performance of a number of patrol officer duties, the uncorrected vision of a significant proportion of the population falls short of 20/20. Among a sample of 200 LAPD applicants, for example, 32% were found to have uncorrected vision of less than 20/20; even a far acuity standard of 20/30 would eliminate 19% of this sample (Table XI-5).

A variety of methods exist for correcting vision, including glasses, contact lenses, orthokeratology, and radial keratotomy. Each method has its attendant advantages and risks. This section discusses factors for an agency to consider when determining the acceptability of each method as a reasonable accommodation for visually impaired candidates.

TABLE XI-5
Distribution of Uncorrected Vision in 200 LAPD Applicants. Best Vision With Both Eyes Open.

Uncorrected Vision*	Percent of Applicants With This Level of Vision or Better
20/20	68%
20/25	75%
20/30	81%
20/40	83%
20/50	86%
20/80	90%
20/200	94%

*Single character errors were ignored except at the 20/200 level; 20/40-1 was considered 20/40, 20/200-1 was considered to be worse than 20/200.

From Goldberg, R.L. 1993. Uncorrected vision of LAPD applicants. Unpublished data.

1. Glasses:

Whether glasses represent a reasonable accommodation depends on the consequences of their use for the safety of the candidate and others. Two interrelated risks must be assessed: (1) the probability that an officer would lose the use of his/her glasses during a critical incident; and (2) the likelihood that the loss of glasses during a critical incident would result in significant impairment and/or injury. These concerns, in turn, must be balanced against the potential benefits of the use of glasses, such as protection against thrown objects, sand, etc.

a. What is the probability of an officer losing the use of glasses while on duty, particularly during a critical incident?

During a critical incident, glasses can become dislodged and/or broken when an officer is assaulted by a resisting suspect, when an officer is pursuing a suspect, or when an officer is required to make a sudden vehicle stop. Moreover, climatic factors such as rain or snow may also suddenly deprive an officer of full visual correction.

Since the probability of these events may vary greatly across agencies, each agency needs to examine its own experience. Methods used to accomplish this have generally consisted of questionnaire surveys of incumbents, or reviews of eyeglass reimbursement requests. Unfortunately, both methods have their limitations. Questions posed by a questionnaire may be easily misinterpreted if the respondents are not personally interviewed (Holden, 1993). Reimbursement lists do not include all incidents in which glasses are lost, rather only those instances in which they are broken.

There are several questionnaire surveys that are noteworthy, however. In 1987, the City of Los Angeles asked 195 incumbent LAPD officers who wore glasses whether they had ever been involved in critical incidents where they needed to see without their glasses (Mancuso, 1987). Eighty-six officers (44%) answered affirmatively (Table XI-6). When asked how often these situations occurred, approximately 28% of the officers stated less than once per year, 45% stated 1-6 times per year, 13% stated 7-20 times per year, and 14% stated more than 20 times per year. Together, these 86 officers had to function in at least 386 critical incidents per year without their glasses. For the entire group (N = 195), on average, each officer was required to function without glasses approximately twice per year during a critical incident.

A very similar questionnaire survey was conducted on 292 officers from the City of Columbus, Ohio (Good & Augsburger, 1987). Fifty-two percent of the officers reported that their glasses dislodged while performing police duties at least once in their career (average length of service = 15.7 years). The probability of dislodgement was 34% per year per officer. In another study (Holden, 1993), 52% of police executives

TABLE XI-6
1987 LAPD Vision Questionnaire of Incumbent Police Officers

	Percent Answering Yes	
	Glasses	Contacts
Have you ever sustained an on-the-job injury specifically related to your wearing your corrective lenses?	5% (10/194)	0% (0/38)
Have you ever been involved in critical incidents, including but not limited to the apprehension of suspects, physical altercations, or vehicle pursuits, which necessitated that you see without your corrective lenses?	43% (83/195)	11% (4/38)
Has your wearing corrective lenses ever been an issue during a court appearance?	15% (27/184)	0% (0/36)
Do you believe that wearing corrective lenses presents an imminent hazard to your safety, that of your co-workers, or that of the public in any way?	6% (12/195)	0% (0/38)
Have you ever encountered any job safety problems caused by your corrective lenses?	28.9% (57/197)	2.6% (10/38)

Mancuso, R. 1987. Responses of myopic LAPD officers to a vision questionnaire. Unpublished study.

queried at an FBI conference reported that they knew of incidents in which officers lost their corrective lenses in the course of duty.

The Ohio survey also examined the impact of climatic factors. Sixty-seven percent of officers reported that they have had to remove their glasses because of rain or snow at least once in their career; 56% reported removing their glasses due to fogging. Unfortunately, the survey did not inquire as to whether the officers were involved in critical incidents during any of these occurrences.

There have been two published studies of glasses reimbursement rates. Sheedy (1980) reported that during a two-year period the City of Columbus, Ohio reimbursed 8 officers for glasses broken during altercations. Giannoni (1981) reported that during fiscal year 1979-80 the CHP reimbursed 17 officers for glasses broken during altercations and 2 officers who lost their glasses during foot pursuits (Table XI-7). Unfortunately, neither study provided data on the total number of glasses-wearing officers to permit calculation of the relative rates of loss or breakage.

Dodson (1993) and others have argued that the risk of an officer losing his/her glasses can be virtually eliminated by use of military spectacles and other devices aimed at securing glasses to the head. Several combat spectacles and glasses-retaining devices were evaluated by the POST

TABLE XI-7
Number of Prescription Eyeglass Reimbursement Requests Submitted by CHP During 1979-80 by Job-Related Loss or Breakage Categories

Category	Number of Reimbursement Requests
1. Assault/resisting arrest	17
2. CHP patrol car/motorcycle accident	4
3. Removing debris on highways/ freeways	1
4. Accident investigations	3
5. Rescue/first aid	4
6. Foot pursuits	2
7. Operating motorcycle	2
8. Routine stop	5
9. Other*	9

*Fall on pavement, sparks from battery, etc.

From Giannoni, B. Entry-level vision requirements validation study. Personnel Bureau, California Highway Patrol. October 1981.

vision panel.[4] Retaining devices such as straps and cords were found to be a potential safety hazard; during an altercation, they could be used to choke the officer. It was also determined that glasses held tightly by elastic, as is common with athletic eyewear, could be forcibly snapped back into the officer's face. Moreover, it was deemed unlikely that the tight elastic would be tolerated for an eight-hour shift.

Newer types of combat frames that are secured by a "D" shaped ear ring were also evaluated, but found to be uncomfortable when fitted tightly enough to avoid dislodgement during altercations -- a light tapping to the side of the frame caused severe pain to the bridge of the nose. Although more attractive than traditional military frames, the newer generation of combat spectacles were also found to be very conspicuous and relatively unattractive, which could have direct implications for their acceptance, use, and public reaction.

Note: All glasses worn by officers on duty should consist of polycarbonate lenses and frames that meet ANSI Z87.1 specifications. This will greatly reduce the likelihood and severity of injury to the officer.

[4] Vision panel participants are listed in footnote 1, p. XI-1.

b. How often would the loss of glasses result in injury or other negative consequences?

It has been argued that losing one's glasses during a critical incident would be unlikely to result in negative consequences for all but the severely myopic, since a suspect is usually situated very close to the officer in these situations (Holden, 1993; Dodson, 1993). Situations such as these may be further mitigated by the presence of a partner and/or the potential availability of a spare pair of glasses. However, a recent study conducted for the California Youth Authority showed that refractive error affects the visual detection and identification of weapons even at distances as short as 5-7 feet (Johnson & Brintz, 1993). Even those who advocate this position acknowledge the seriousness of the consequences that could (and do) occur in these situations. Holden (1993) reports an incident in which the loss of glasses is believed to have contributed to the death of an FBI agent. Dodson (1993) recommends that myopic officers be required to wear combat glasses and be provided with handguns that have special high-visibility sights.

A survey conducted in 1984 by POST asked 53 glasses-wearing officers from various agencies to report on any negative experiences (including but not limited to impairment or personal injury) associated with wearing glasses while on duty. As indicated in Table XI-8, only four negative consequences were reported, three of which were associated with glasses dislodgement during altercations. This rate is equivalent to an annual risk per officer of approximately 1.1% (average length of service = 5 years).

TABLE XI-8
Reported Instances of Negative Consequences Resulting From Use of Corrective Lenses by Officers

Outcome	Lenses	Impairment	Circumstances
Failure to provide required duty	Glasses	Chemicals	Maced in combative situations--arrest delayed
Physical harm	Soft contacts	Fogged up	Lack of sleep prevented me from safely operating motor vehicle
Property damage	Glasses	Dislodged	Glasses dislodged and slipped off in altercation
Property damage	Glasses	Dislodged	Glasses broken as result of fight
Physical harm	Glasses	Dislodged	Glasses flew off in fight with suspect on PCP. As result I received minor injuries while wrestling on pavement

From Briggs, R. 1984. Visual skills job analysis and automated vision testing. Unpublished technical report for the Commission on Peace Officer Standards and Training.

The POST survey also asked a larger group of officers whether they knew of other officers who experienced the same array of negative consequences on the job due to use of glasses. Such questions generate a large number of anecdotal cases, but not incident rates. One hundred and forty respondents reported a total of 16 such incidents (Table XI-9). Thirteen of these incidents involved altercations; one involved glasses becoming fogged during an arrest.

In assessing risks, an agency may wish to examine the following agency-specific factors:

How often do officers patrol alone? The 1984 POST survey reported numerous incidents in which officers who lost their glasses required the immediate assistance of other officers to control a suspect and make an arrest (see Tables XI-8 & XI-9). Holden (1993) reports an incident in which an officer who lost his glasses could not read the license number of an escaping suspect's vehicle.

How often do foot pursuits occur after altercations? In this situation, a distance is created between the officer and the suspect. An officer who has lost his/her glasses may subsequently misidentify the suspect in a crowd, overlook the suspect in hiding, or be unable to determine if the suspect is holding a weapon.

How often does an officer discharge a gun after an altercation, and what are the distances involved?

c. How often do glasses provide protection from hazards?

The 1984 POST survey also asked officers if glasses ever provided a beneficial effect. The 53 officers who wore glasses listed over 50 incidents in which they felt that glasses protected them from injury (Table XI-10). Some of these incidents involved confrontations with suspects who tried to disable the officer by throwing sand or other matter into the officer's face. Officers in the study who did not wear glasses also reported incidents in which they had observed the protective effect of glasses among their colleagues (Table XI-11).

An agency must balance the relative risks and benefits associated with wearing glasses when developing a standard on their use by officers. Since the degree of risk associated with wearing glasses is directly proportional to the candidate's degree of visual impairment (see Table XI-4), it is reasonable to conclude that glasses represent an acceptable accommodation for candidates with relatively mild degrees of visual impairment.

TABLE XI-9
Reported Instances of Negative Consequences Resulting from Corrective Lenses as Observed by Other Officers

Outcome	Lenses	Impairment	Circumstances
"Other"	Glasses	Fogged	Cold to warm -- glasses fogged. Had to clean glasses before continuing duty
"Other"	Glasses	Fogged	Had to clean & therefore, out of service
Damage to property	Glasses	Dislodged	Officer's glasses broken in physical confrontation
Physical harm	Glasses	Dislodged	415 fight -- officer struck in face -- momentary daze -- unable to see target until suspect struck again
Property damage	Glasses	Dislodged	Suspect knocked deputy's glasses to ground & broke them
Failure to provide service. Physical harm, property damage	Glasses	Dislodged	During arrest, partner lost his glasses, cut his nose and broke his glasses
Physical harm Auto accident	Glasses	Dislodged	Altercation with suspect/frame pushed in eyes, glasses in eye
Physical harm	Glasses	Dislodged	Cut on face from glasses being forced into the face
Other (altercation resulted)	Glasses	Dislodged	Suspect subdued by other officers
Failure to provide service	Glasses	Fogged	Entered sauna to investigate case -- glasses fogged & unable to see
Failure to provide service Auto accident	Glasses	Dislodged	Pursuit of suspect
Physical harm	Glasses	Dislodged	Deputy hit in face by suspect -- glasses (frame) cut his face and fell off
"Other"	Soft contact lenses	Dislodged	Contact dislodged during search of prisoner
"Other"	Glasses	Dislodged	Officer's glasses dislodged in altercation -- suspect ultimately injured
Failure to provide service	Glasses	Fogged	Other officers had to assist in arrest
Physical harm	Glasses	Dislodged	Officer struck while wrestling with suspect -- Officer cut on forehead
Failure to provide service. Damage to property	Glasses	Dislodged	Officer's glasses knocked off while attempting to make arrest

From Briggs, R. 1984. Visual skills job analysis and automated vision testing. Unpublished technical report for the Commission on Peace Officer Standards and Training.

TABLE XI-10
Reported Instances Where Corrective Lenses Provided Officers Protection

# Times	Lenses	Circumstances
1	Glasses	Broken windshield -- eyes protected from glass
5	Glasses	(1) Lead splatter at range (2) Wall particles -- removing evidence (3) Dura print fumes
4	Glasses	(1) Flying objects (2) Leaking chemicals in a fire
5	Glasses	Tear gas, objects thrown, struck in face, spit on
1	Glasses	Suspect threw sand -- glasses protected eyes
5	Glasses	Glasses protected eyes from thrown gravel
10	Glasses	Glasses acted as shield for eyes
10	Glasses	Prevented dust or hard objects from entering or harming my eyes
Many	Glasses	Objects thrown, i.e., dirt, sand, etc., by people and natural forces. Also limbs, branches, bushes scratched face but not eyes
-	Glasses	Strong winds -- debris hit glasses
Several	Glasses	Protection from wind blown dust/dirt
3	Glasses	Blowing sand in two storms. Blowback from weapon on range
4	Glasses	Protection against blowing sand/debris from helicopter blade thrust
Many	Glasses	Sand/rocks/bugs while a motorcycle officer

From Briggs, R. 1984. Visual skills job analysis and automated vision testing. Unpublished Technical Report for Commission on Peace Officer Standards and Training.

In deciding upon an uncorrected vision standard for glasses-wearers, an agency may also want to consider that visual correction is often not sought until one's native vision deteriorates into the 20/40 range. This would indicate that 20/40 can serve as a threshold level for establishing functional impairment. Visual acuity of 20/40 or better is also required by the California Department of Motor Vehicles.

TABLE XI-11
Reported Instances Where Other Officers' Corrective Lenses Provided Protection

# Times	Lenses	Circumstances
3	Glasses	Thrown bottles -- shattered glasses
2	Glasses	Suspect pursuit -- glasses broken in fight
-	Hard contacts	No injury when struck in face (would have been injured w/glasses)
2	Glasses	Prevented injury to eyes by shielding object
1	Glasses	Outside mirror shattered by bullet, throwing glass in deputy's face
1	Glasses	Eyes protected from chemical agent thrown by suspect
Several	Glasses	Thrown sand & gravel & other objects
2	Glasses	Motor officer being hit in glasses by small objects
1	Soft contacts	Eyes protected when refueling patrol car with propane
2	Soft contacts	Dust blown/thrown objects
1	Glasses	Windshield shattered -- glasses protected eyes from glass
1	Glasses	Protection on range
1	Glasses	Airborne particles hitting glasses
2	Glasses	(1) Exploding battery (2) Glasses struck & broken by foreign object
1	Glasses	Suspect threw sand at officer
3	Glasses	Flying rocks, dust, etc. bouncing off passing vehicle, etc.
Several	Glasses	Protection from sand/bugs/gravel for motor officers
2	Glasses	Motorcycle officers being hit in glasses by small objects

From Briggs, R. 1984. Visual skills job analysis and automated vision testing. Unpublished technical report for the Commission on Peace Officer Standards and Training.

The differences in responses of mildly vs. moderately myopic LAPD officers, although not statistically significant, lend further support for a 20/40 uncorrected standard (Mancuso, 1987). In response to the question: "Do you believe that wearing corrective lenses presents an imminent hazard to your safety, that of coworkers, or that of the public in any way?," 13% of the 23 officers who knew that their uncorrected vision in their better eye was worse than 20/40 answered affirmatively. This response compared to only 5% answering affirmatively among the other 172 less myopic officers.

SUMMARY: **An uncorrected standard of 20/40 for glasses-wearing officers is reasonable for agencies where the essential job functions include the use of single-officer patrol units, involvement in altercations with suspects, or use of lethal force.** A 20/40 standard also provides a margin of safety when working in low lighting conditions or inclement weather. At agencies where officers are rarely without support and are very unlikely to be subject to assault, a standard in the range of 20/50 to 20/100 is probably reasonable. Agencies who accept candidates with 20/200 vision or worse must do so with the awareness that the vision of these persons will be markedly impaired if they lose their glasses (Table XI-4).

The use of glasses (especially those with polycarbonate lenses and ANSI Z87.1 frames) is likely to reduce the overall incidence of unilateral eye injuries (see Tables XI-10 and XI-11). Moreover, sighting around a barrier is not an issue with glasses. Consequently, requiring an uncorrected minimum in the weaker eye of a person who wears glasses does not have strong support.

2. Contact Lenses:

Contact lenses can be classified by their rigidity. "Hard" lenses, made of polymethylmethacrylate (PMMA), are small, inflexible, and impermeable to oxygen. These were the original contact lenses developed decades ago. Advantages include easy care (no sterilization required) and the ability to correct astigmatic errors. Disadvantages include low comfort, easy dislodgement, high risk of particle entrapment and inappropriateness for overnight (extended) wear. Fully "soft" lenses were developed in the 1970's. These are large, flexible and permeable to oxygen. Advantages include high comfort, low risk of dislodgement, low risk of particle entrapment, and availability in extended wear varieties. Disadvantages include the need for regular cleaning/disinfection and the inability to correct for astigmatic error. The latter problem can be overcome with expensive soft lenses known as "Toric" which are somewhat thicker and weighted on one edge.

In the last decade, a new lens known as "semi-soft," "semi-rigid," "semi-permeable," or "gas-permeable" was developed. These are thinner hard lenses, made from materials permeable to oxygen. They are comfortable, can correct astigmatic error, and are associated with fewer complications than soft lenses (Key, 1990).

Two issues must be considered when determining whether contact lenses constitute a reasonable accommodation for visually impaired candidates: (1) safety, and (2) candidate compliance after hire.

a. **Safety**. Use of contact lenses could potentially create a safety hazard under certain circumstances:

(1) If both lenses were simultaneously lost during an altercation. Compared to glasses, this occurrence would be expected to be very rare. A phone survey was conducted on 12 optometrists in the Southern California area (Bible, 1993). The optometrists were selected randomly from a phone book, had an average of 2000 contact lens patients, and had been in practice for an average of 15 years. None of the optometrists could recall ever having a patient report losing both lenses simultaneously except during water sports. This result is not unexpected, since a direct blow to the eye may dislodge one lens, but would not affect the other.

While the loss of one lens would not affect vision in the other eye, this risk can be further reduced by prohibiting the use of hard lenses. Good & Augsburger (1987) asked 108 police officers who wore contacts if they had ever lost a contact lens while on duty; 18.8% of the 16 hard lens users answered affirmatively, compared to 10.5% of the 19 officers who used gas permeable lenses and 9.6% of the 73 officers who used soft lenses.

(2) Use of contacts in hazardous environments. During the 1960's and 1970's, recommendations were made to prohibit the use of contacts in hazardous environments due to concerns about absorption of chemicals and subsequent damage to the eye. However, these concerns were not based on controlled studies. Kok-van Aalphen (1985) and Royall (1977) found that candidates wearing soft contact lenses could actually tolerate tear gas for a slightly longer period of time. In fact, numerous published studies of both humans and animals exposed to a wide range of chemicals have found that contact lenses have either no effect or provide protection when the eye is exposed to toxins (Nilsson, et al., 1981; Nilsson & Andersson, 1982; Rengstorff & Black, 1974). Together, these studies have shown that absorption of some chemicals by soft lenses does occur, the lenses acting as a sponge to remove the chemicals from contact with the eye. There are no comparable studies on hard or semi-permeable lenses in toxic environments. However, since these smaller lenses do not completely cover the cornea, they would not be expected to provide the same protective benefit.

(3) Particle entrapment under a lens can result in a "contact lens attack" which is acutely painful and incapacitating. Vision in the non-affected eye is markedly impaired by sympathetic tearing and photophobia until the other lens is removed. Particle entrapment occurs when the lens slides over a particle or when tear fluid is exchanged from under the lens.

Although there are no published studies on the subject, many vision specialists agree that the risk of entrapment for hard and semi-permeable lenses is much greater than for soft lenses. Because they are smaller in diameter, hard and semi-permeable lenses slide on the cornea much more than do soft lenses. In addition, the rate of tear fluid exchange from underneath these lenses is an order of magnitude greater than with soft lenses. For these reasons, the American Optometric Association has recommended against the use of hard and semi-permeable lenses in

industrial environments (AOA, 1990). Similarly, these lenses are not recommended for military aviation due to the high levels of particulate in cabin air (Polse, et al. 1990).

The safety of contact lenses has also been addressed in several questionnaire surveys of patrol officers:

- The 1984 POST vision study asked 17 officers if they ever experienced negative consequences from their personal use of contacts (12 wore soft and 5 wore hard lenses). Only one incident (which was non-critical) was described (Table XI-8). One hundred and forty officers were also asked if they had ever observed others experiencing negative consequences due to problems with their contacts. Again, only a single incident was reported (Table XI-9). However, the officers did report several incidents in which contact lenses provided protection against hazards (Table XI-11).

- In 1987, the City of Los Angeles conducted a questionnaire survey of 38 officers who wore contact lenses (soft and hard). No officer reported having sustained an on-the-job injury due to wearing contacts (Table XI-6). Similarly, none believed that their use of contacts created an imminent safety hazard. Only 4 (11%) reported having been involved in critical incidents where they had to see without their correction. Of these four, one officer reported that this occurs less than once per year, another reported occurrences of only 1-6 times per year, and the remaining two officers reported occurrences of more than 6 times per year. Ten of the officers indicated that they had encountered job safety problems caused by the contact lenses, due mostly to lenses slipping/popping out, or to particle/hair entrapment.

The available evidence suggests that soft contact lenses can be used by patrol officers with minimal risks. Their use is preferable to hard or semi-permeable lenses, since wearers are less likely to be subject to sudden incapacitation due to particle entrapment.

b. **Compliance.** Compared to lens dislodgement, there is an arguably greater likelihood that individuals will discontinue wearing their lenses, either temporarily or permanently.[5]

(1) Temporary Discontinuation: How many days per year will a patrol officer be unable to wear SCLs due to eye infections, corneal abrasions, allergies, or other medical conditions? Nilsson and Lindh (1984) reported that temporary medical conditions resulted in an average of only 3 days of non-wear per year for daily-wear SCL users. Studies of extended wear SCLs have found that complication rates are significantly higher than with daily wear lenses (Kirn, 1987); however, this appears to occur primarily in

[5]The following discussion is limited to soft contact lenses due to the considerations discussed earlier.

the first year of use. Several studies have found that those who successfully complete 12 months of use have temporary and permanent discontinuation rates which are similar to that of daily-wear users (Nilsson & Persson, 1986; Binder, 1983).

In persons who have worn SCLs successfully for more than a year, motivational factors are probably responsible for more episodes of temporary discontinuation than are medical complications. Since 1988, the LAPD has hired over 300 officers who have worn SCLs successfully for at least one year and have signed a pre-placement agreement obligating them to wear SCLs whenever assigned to field duty. (See Figure XI-3 for a sample pre-placement agreement.) During five random department-wide eye inspections conducted between June 1990 and November 1991, the LAPD found non-compliance rates to vary between 2-8%, with an average rate of 5%. Thirty officers were found on duty without their SCLs on a total of 39 occasions; five officers were non-compliant twice, and two officers were found non-compliant three times. Medical reasons were cited for non-compliance in only 6 (15%) of the incidents. More commonly, officers said they forgot their contacts, lost one, or now prefer to wear glasses. Examining non-compliance as a function of time since hire revealed a slight, nonsignificant increase in non-compliance in officers who had been on the job for longer periods of time (Figure XI-4). To date, discipline has been limited to written reprimands, and quarterly eye inspections have not been conducted regularly. Therefore, it is probable that non-compliance among these patrol officers could be significantly reduced by providing stronger administrative controls.

(2) Permanent Discontinuation: Several studies involving users of daily-wear SCLs have found that quit rates are highest during the first year of use. In a retrospective study of 196 SCL users, Robbins (1977) found that 13% quit within the first year after the lenses were prescribed. In a similar retrospective study of 92 new SCL users, Broome and Classe (1979) observed a first year drop-out rate of 28%; quit rates during the first and second 6 months of wear were both equal to about 15%. Both studies found that drop-out rates significantly decrease after the first year. Combined drop-out rates in the second and third year of use were 5-7% (Table XI-12).

As with temporary discontinuation, a large percentage of participants quit because of poor motivation. In the Broome study, only 5% of the participants quit daily-wear SCL use on the advice of a doctor (Figure XI-5). This has been a general finding in many studies. In a three-year prospective study of 100 SCL wearers, Nilsson and Lindh (1984) found that only 2% discontinued daily-wear SCL use on a permanent basis due to medical complications. After one year of successful use, similar findings have been reported for extended-wear SCL users (Nilsson & Persson, 1986; Binder, 1983). To date, only one of the 300 LAPD officers has permanently discontinued SCL use due to medical complications.

SUMMARY: Based on these studies of safety and compliance, it would appear that **the use of soft contact lenses can be considered a reasonable accommodation for candidates who have been successful SCL wearers for at least one year.** However, before SCL candidates are granted waivers of uncorrected vision requirements, **an agency should develop a program to ensure that these individuals will not go into the field without wearing their contact lenses.**

With proper administrative controls in place, the likelihood of either noncompliance or SCL dislodgement (particularly double dislodgement) is quite low. Some agencies, nevertheless, may feel that the severity of the risk posed if an extremely myopic officer needed to perform without visual correction offsets even this low likelihood, and as a result provides ample justification for establishing an uncorrected vision standard. However, **if an uncorrected standard is established, it is recommended that it be no more stringent than 20/200.** Vision at this level, although severely limited[6] (see Table XI-4), would be expected to allow some basic functional capacity as a patrol officer (under good lighting conditions). It must be noted, however, that upwards of 6% of the applicant population may be unable to meet even a 20/200 uncorrected standard (see Table XI-5).

TABLE XI-12
Rates of Soft Contact Lenses "Drop-Out"

Time Period	Number Using SCLs at Beginning of Time Period	Percent Who Quit During Time Period (n)
0-12 Months	288	18% (51)
13-24 Months	136	5% (7)
25-36 Months	74	7% (5)

Combined data from: Broome, P.W. & Classe, J.G. 1979. Long-term success in contact lens wear. Contact Lens Forum (September):15-27; and Robbins, J.C. 1977. A three-year retrospective soft lens contact lens study. In Proc 2nd Natl Res Symp Soft Contact Lenses Int. Congr. Ser. No. 398:57-61. Excerpta Medica. Amsterdam.

[6]20/200 is the threshold for functional blindness as established by the Social Security Administration.

FIGURE XI-3
Sample Pre-Placement Agreement Involving Use of Soft Contact Lenses

SAMPLE

PRE-EMPLOYMENT NOTICE OF REASONABLE ACCOMMODATION REQUIREMENTS

Name: _____ Date of Hire: _____

Medical Condition: Poor uncorrected distance vision - myopia correctable with soft contact lenses.

I acknowledge that the medical condition noted above was present at the time that the (name of law enforcement agency) offered me employment. I affirm that I am currently, and have been for the past twelve months prior to employment, a bona fide, successful soft contact lens wearer. I also understand that my use of soft contact lenses is permitted as a reasonable accommodation for my distance vision myopia.

I understand that my ability to perform the duties assigned to me as a full-duty patrol officer may be contingent upon my ability to successfully wear soft contact lenses on duty, and I shall wear such lenses whenever I am on duty except when authorized by my supervisor (or the Employee Assistance Unit) to do otherwise. I also understand that it is my responsibility to notify my supervisor (or the Employee Assistance Unit) should I become unable to wear soft contact lenses while on full duty or should I take any other medical action which would otherwise affect my vision or my ability to wear soft contact lenses. I am aware that if I become unable to wear soft contact lenses while on full duty, I may be assigned to restricted duty assignments.

I have been informed that, as part of the reasonable accommodation to the medical condition noted above, my use of soft contact lenses may be candidate to verification by my employer and to such medical eye examination as necessary in the judgement of my employer's medical staff during the last month of my training at the Police Academy and thereafter, unless otherwise medically indicated.

By my signature below, I acknowledge that I have read and accept the conditions of this Notice.

_____ _____
SIGNATURE DATE

FIGURE XI-4
Non-Compliance of LAPD Officers with Soft Contact Lenses Based on Time Since Hire (N=808)

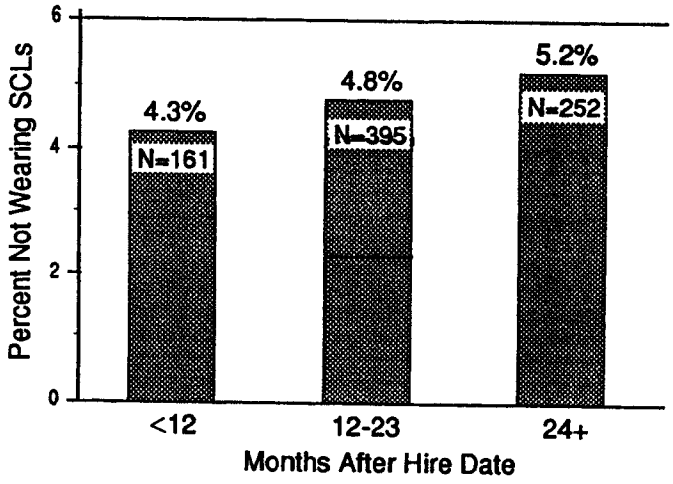
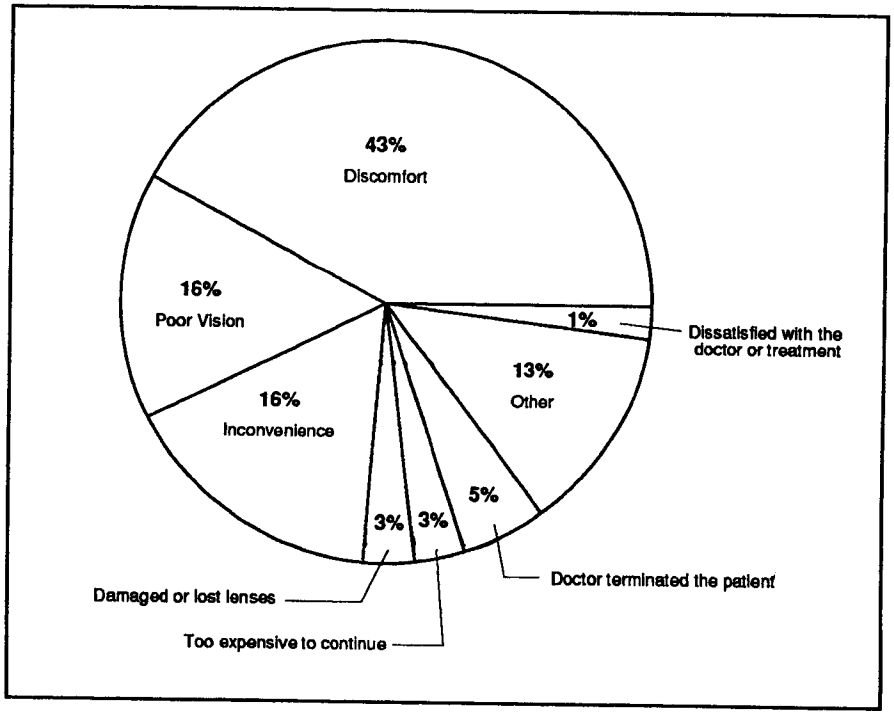


FIGURE XI-5
Reasons for Discontinuing Contact Lens Wear (N=92)



Adapted from Broome, P.W. and Classe, J.G. 1979. Long-term success in contact lens wear. Contact Lens Forum (September): 15-27.

3. Orthokeratology:

Orthokeratology refers to the use of special hard contact lenses that "mold" the shape of the cornea to reduce myopia. The method is somewhat analogous to the use of orthodontics for realigning teeth. The individual may wear the lenses for a period of time, then remove them to enjoy a period of good vision without lenses. The lenses are put back into the eyes 1-3 days later when the individual's vision deteriorates. Some persons wear gas-permeable ortho-K lenses only while sleeping, and then sustain good vision without contacts the next day.

There are several concerns regarding the use of orthokeratology by patrol officers:

(a) Fluctuating vision: When the lenses are not worn, the wearer's vision slowly deteriorates. The individual reinserts the lenses when the poor vision is no longer tolerable. Since many find vision even in the 20/40 - 20/50 range tolerable, it is not unlikely that an officer would be on duty with vision in this range. It is unrealistic to expect an agency to perform vision testing at the beginning of each shift and at sufficiently frequent intervals thereafter to ensure vision (with or without the lenses) at or near 20/20.

(b) Compliance: Fluctuating vision could be eliminated by requiring the candidate to wear the lenses while on duty. However, it must be noted that orthokeratology lenses are frequently worn only while sleeping. (In fact, many orthokeratology users spend $1,500-$2,000 because they do not want to wear contact lenses all of the time.) Furthermore, since they do not comply with the cornea's natural contour, some individuals find these lenses quite uncomfortable.

(c) Particle entrapment: Since orthokeratology lenses are either hard or semi-permeable, requiring constant use by an officer could create a similar risk of particle entrapment (see "Contact Lenses").

The unique advantage of orthokeratology is that visual acuity is maintained when the lenses are removed/dislodged. However, this benefit would require constant use while on duty, a practice that is contrary to the way these lenses are commonly used as well as unrealistic for those individuals who find the lenses uncomfortable. Moreover, these lenses create the same risk of sudden incapacitation due to particle entrapment as do hard or rigid gas permeable lenses.

Because of concerns over fluctuating vision, monitoring compliance, and particle entrapment, **the use of SCLs is preferred over ortho-k lenses for patrol officers.** Therefore, candidates should be encouraged to switch from orthokeratology lenses to soft contact lenses. At a minimum, before ortho-k wearers are accepted, they need to show **a history of problem-free, daily, daytime use of these lenses for a period of no less than one year;**

furthermore, **strict administrative controls (including frequent lens checks) should be implemented to ensure that ortho-k wearers do not perform on duty without their lenses.**

d. FAR ACUITY SUMMARY

Based on available evidence, the following recommendations are made for establishing far acuity standards for entry level patrol officers:

Corrected Vision:

- Best corrected vision of 20/20.
- Best corrected vision should be assessed for **both** eyes together.

Use of Glasses: Due to the likelihood of dislodgement or breakage, candidates who wear glasses should meet an uncorrected far acuity standard of between 20/40 - 20/100. The exact far acuity standard selected should be based on agency-specific considerations such as:

- The likelihood and circumstances surrounding the use of firearms at that agency (e.g., distances of targets, frequency of foot pursuits in conjunction with weapon use)
- The likelihood of engaging in combative situations
- Deployment of one officer patrol units
- Inclement weather, night shift duty, and other environmental conditions that may affect visibility with glasses

Use of Contact Lenses:

- Use of soft contact lenses (SCLs) is permissible by candidates who have at least one year of successful SCL use, and provided that the agency uses pre-placement agreements and has a monitoring program in place.
- SCL use is preferred over the use of other types of contact lenses (i.e., rigid gas permeable or hard lenses) due to concerns of particle entrapment and dislodgement.
- The establishment of an uncorrected vision standard for SCL wearers should be an agency-specific risk management decision. However, should an agency decide to create an uncorrected standard, it is recommended that it be no more stringent than 20/200 (both eyes).

Use of Orthokeratology:

- Because of concerns over fluctuating vision, particle entrapment, and the inability to monitor compliance, SCLs are preferred over ortho-k lenses for patrol officers. At a minimum, ortho-k wearers should be required to always wear their lenses while on duty, and to meet the same visual acuity and compliance requirements as discussed above for SCL wearers.

e. RECOMMENDED EVALUATION PROTOCOL

Prior to evaluating candidates, the hiring agency should supply the vision specialist with a set of written guidelines which describe the accepted policies on corrected vision, uncorrected vision, contact lenses, and orthokeratology.

Procedures for testing far acuity are described under General Screening Recommendations.

CORRECTED VISION: The physician should seek an explanation if a candidate's corrected vision (or native vision if no corrective devices are used) is worse than 20/20 in each eye, regardless of the agency's corrected vision standard. While the most common cause is inadequate corrective lens prescription, poor corrected vision may be indicative of serious eye disease which should be evaluated by a vision specialist. This possibility should be ruled out before a candidate is given a clearance.

UNCORRECTED VISION: In most cases, candidates who do not meet the uncorrected vision standard should have an opportunity to have their vision retested by their personal vision specialists. Unfortunately, measurement of uncorrected vision can vary with squinting, time of day, and the lighting conditions during testing. Consequently, physicians are commonly faced with the task of resolving discrepancies between the results of pre-employment vision testing and the results reported by a private specialist. To adequately resolve these discrepancies, the physician must understand a few basic concepts regarding the optics of corrective lenses:

Lenses with a spherical shape are used to correct either nearsightedness (myopia) or farsightedness (hyperopia). The "strength" or curvature of the required lenses is measured in units known as diopters (D). The diopter strength of a lens is always preceded by either a minus (-) or a plus sign (+) to denote concavity or convexity, respectively. Minus (-) lenses correct for myopia; plus (+) spherical lenses correct for hyperopia.

Astigmatism is an optical irregularity along an axis. Cylindrical lenses aligned along the same axis can correct this error. By convention, cylindrical correction is usually expressed as "minus" (-) diopters, followed by the axis of the cylinder expressed in degrees.

Eyeglass prescriptions are based on the subjective measurement of the individual's spherical and cylindrical refraction. When this is performed manually, it is known as the manifest refraction (MR). Refraction can also be conducted by an automated process, but it is not as accurate. The refraction is always expressed as the spherical correction followed by the cylindrical correction. For example, -1.50 -1.00 x 90 indicates that lenses must be made with a minus 1.5 diopter sphere combined with a 1.0 diopter cylinder aligned along an axis of 90 degrees. If someone has no astigmatism, the cylinder correction is omitted. If someone has only astigmatism, the spherical correction is designated as "plano" (for example, plano -4.50 x 135).

Knowing a candidate's MR can be very helpful in determining the likelihood that squinting occurred during private testing. Peter's Table (Table XI-13) can be used to predict the most probable distant acuity based on refraction. To use Table XI-13, first find the candidate's spherical correction along the far left side of the table. If there is no astigmatism, the predicted acuity is found in the first column to the right (minus cylinders = 00). For example, if the MR is [-1.25], distant acuity is most likely 20/70.

Note that predicted acuity in hyperopes decreases with age. For example, an MR of [+3.00] would indicate an acuity of 20/25 in a 15-year-old, but 20/200 in a 50-year-old. This age-related effect is due to the gradual loss of accommodative power of the crystalline lens in the eye. In young persons, accommodation can completely compensate for mild hyperopia.

Cylindrical correction is found along the top of the table. For the purpose of estimating acuity, the axis of the cylinder can be ignored. Examples include: [plano -2.00 x 125] = 20/70; [+1.75 -1.25 x 275] in a 28 year-old = 20/30; [-0.25 -0.75 x 50] = 20/40.

Note that a small amount of astigmatism can actually improve the vision of older hyperopes. For example, a 45-year-old with an MR of [+3.00 - 2.00 x 45] is likely to have 20/80 vision, while a similar hyperopic 45-year-old without astigmatism (MR of [+3.00]) would probably have 20/200 vision.

Astigmatisms must be expressed as "minus" cylinder when using Peter's Table. If the MR is written with "plus" cylinder, this can be converted to minus by adding the number of cylindrical diopters to the spherical correction (axial changes can be ignored). For example, an MR of [+1.00 +1.00] is equivalent to [+2.00 -1.00]; [-1.00 +1.00] = [plano -1.00]; [-.25 +3.75] = [+3.50 -3.75].

The following is presented as a suggested algorithm for evaluating candidates whose uncorrected distant acuity, as measured during the screening examination, is beyond the hiring agency's standards. Repeat testing by the agency's vision specialist should be performed on all such candidates (preferably with a different eye chart). The most favorable test results should be evaluated using the following guidelines.

GROUP I: UNCORRECTED ACUITY IS WORSE THAN THE AGENCY STANDARD BY ONLY ONE LINE

A "line" refers to the lines on a vision chart (e.g., the 20/40 line). These candidates should have the opportunity to submit the results of a current, private examination which includes the MR. The examination technique used should be the same as described in "General Screening Recommendations - Routine Testing." Past records of previous eye exams should be requested, since they may reveal the candidate's true vision when not motivated to squint.

- If past records and the current private exam indicate acceptable vision, the candidate is passed.

- If either the current private exam results or past records confirm unacceptable vision, the candidate should be restricted from performing vision-oriented essential job functions (e.g., driving, weapon use, etc.) Past records, unlike the results of a current private exam, are unlikely to be biased by squinting.[7]

- If the current private exam is acceptable, but no past records are available, use the MR and Peter's Table (Table XI-13) to assess the likelihood of squinting.

GROUP II: UNCORRECTED ACUITY IS WORSE THAN THE AGENCY STANDARD BY TWO LINES OR MORE

Repeat testing by a private vision specialist is usually not helpful. These candidates should be restricted from involvement in critical situations which may result in loss of glasses. The use of soft contact lenses is generally an acceptable alternative for these candidates, except for those individuals who fail to meet an agency's uncorrected acuity standard for soft contact lens wearers (if any).

SOFT CONTACT LENSES: The physician should determine if the candidate has worn SCLs regularly and successfully for at least one year. To evaluate the candidates' past experiences with SCL use, and the existence of any contraindications to the continued successful use of SCLs, candidates should be asked to submit the results of a current contact lens examination by a vision specialist (see form provided as Figure XI-6), and a copy of their vision records.

There are several absolute and relative contraindications to the use of contact lenses. Diabetes can result in loss of corneal sensation which can decrease an individual's awareness of epithelial damage from the lens. Increased glucose concentrations in the tear fluid also serve to encourage infections. Other absolute contraindications include autoimmune disorders, which are commonly

[7]Note: Vision does not improve with age.

complicated by the sicca syndrome (dry eyes and mouth). These would include scleroderma, Sjorgen's syndrome, rosacea, rheumatoid arthritis, and lupus.

Relative contraindications to SCL use include a history of dry eyes, use of antihistamines (which decrease tear flow), or a history of medical complications from contact lens use. These include corneal abrasion, corneal infection, neovascularization of the cornea (often seen in post-radial keratotomy patients who wear contacts), and giant papillary conjunctivitis (GPC). GPC is a sterile inflammatory reaction of the upper eye lid caused by friction and irritation from repetitive blinking over the upper portion of the contact lens. This condition occurs more commonly with extended wear lenses. It is treated with steroids and discontinuation of contact lens use for a period of time.

Candidates who currently wear hard or semi-permeable lenses should be encouraged to be refitted with soft lenses. Those with astigmatism may have to purchase "toric" lenses at an increased cost. Complications such as neovascularization, superior limbic keratoconjunctivitis, GPC, corneal ulcers, and infections are more common with soft lenses (Key, 1990). For this reason, requiring some minimal period of use of SCLs, such as 6 months, would not be unreasonable for candidates who have an established history of success with hard or semi-permeable lenses and no prior negative experience with SCLs.

USE OF SCL AFTER RADIAL KERATOTOMY (RK): It is not uncommon for individuals to obtain SCLs when their post-surgical vision requires correction. Unfortunately, there is evidence that SCLs (especially extended-wear) can increase the risk of neovascularization of the surgical scars (Edwards & Schaefer, 1987). In the largest post-RK study, all participants who developed significant amounts of neovascularization 1-5 years after surgery had worn SCLs (Waring, et al., 1991). SCLs may also worsen a common complication of RK known as progressive hyperopia (Edwards & Schaefer, 1987). For these reasons, RK surgery should be considered a relative contraindication to the use of SCLs. In post-RK candidates with unacceptable uncorrected far acuity, the use of SCLs should not be considered a reasonable accommodation unless there is no evidence of significant neovascularization (i.e., vascularization of one or more scars for at least 25% of its length [Waring, et al., 1991]) or progressive hyperopia. Moreover, these candidates should be evaluated for diurnal variation as in any other post-RK candidate (see Section 2 - Radial Keratotomy).

ORTHOKERATOLOGY: Measuring "uncorrected acuity" in these candidates is difficult because their vision slowly deteriorates after their ortho-k lenses have been removed. For this reason, vision records which pre-date the initiation of ortho-k must be obtained to establish the candidates' "native" uncorrected vision. Candidates whose uncorrected vision does not meet the agency's standard should be encouraged to obtain SCLs. At a minimum, ortho-k wearers should be required to always wear their lenses while on duty and to meet the other criteria stipulated for SCL wearers.

TABLE XI-13
Peter's Relation of Error and Acuity

	minus cylinders																
Sphere	00	.25	.50	.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00
-2.00	200	200	200	200	or poorer												
-1.75	100	100	100	200	or poorer												
-1.50	80-100	80-100	100	100	100	200											
-1.25	70	70	70	80	80	100	100	100	200								
-1.00	60	60	70	70	80	80-100	100	100	100	100-200	200						
-0.75	50	60	60-70	70	70-80	80	80	80-100	200								
-0.50	30-40	40	50	50	60	60-70	70	80	80	100	100	100	100	200			
-0.25	25	25-30	30-40	40	50	60	60-70	70	80	80	100	100	100	100	100-200	200	
00	20	20-25	25-30	30-40	40-50	50	60	70	70	80	80	80-100	100	100	100	200	
+0.25	20	20	25	25-30	30-40	40-50	50-60	60	70	70	80	80	100	100	100	100	100-200
+0.50	20	20	20	25	30	40	50	50-60	60	60-70	70	80	80	100	100	100	100
+0.75	20	20	20	25	25-30	30-40	40-50	50	60	60-70	70	70-80	80	80	100	100	100
+1.00	20	20	20	25	25	30	40	50	50-60	60	70	70	80	80	80-100	100	100
+1.25a	20	20	20	25	25-30	30	40	50	50-60	60	70	70	80	80	80-100	100	100
b	20	20	20	25	25-30	30	40	50	50-60	60	70	70	80	80	80-100	100	100
c	25	25	25	25-30	30	40	40-50	50	60	60-70	70	70-80	80	80	100	100	100
+1.50a	20	20	20	25	25	30	40	50	50	60	70	70	70	80	80	80-100	100
b	20	20	25	25	25-30	30	40	40-50	50	60	60-70	70	70-80	80	80	100	100
c	30	25-30	25-30	30	30-40	40	50	50	60	60-70	70	70-80	80	80	100	100	100
+1.75a	20	20	20	25	25	30	40	40	50	50	60	60	70	70-80	80	100	100
b	25	25	25	25	25-30	30	40	40-50	50	60	60	70	70	80	80	100	100
c	40	30-40	30	30-40	40	40-50	50	50-60	60	60-70	70	70-80	80	80	100	100	100
+2.00a	20	25	25	25	25	30	30-40	40	50	50-60	60	70	70	70	80	80	100
b	25	25	25	25	30		40	40-50	50	60	60	70	70	80	80	100	100
c	50-60	40-50	40	40	40-50	50	50-60	60	60-70	70	70	80	80	80-100	100	100	100
+2.25a	25	25	25	25	25	30	40	40	50	60	60	60-70	70	70	80	80	100
b	25	25	25	25-30	30	30-40	40	40-50	50	60	60	70	70	80	80	100	100
c	60-70	60	50	50	50-60	60	60-70	70	70	70-80	80	80	100	100	100	100	100-200
+2.50a	25	25-30	25	25	25-30	30	30-40	40	50	50-60	60	60-70	70	70	80	80	100
b	30	30	25	30	30	40	40	50	50	60	60	70	70	80	80	100	100
c	70-80	70	60	60	60	60	60-70	70	70	70-80	80	80	80-100	100	100	200	200
+2.75a	25	25	25	25	30	30	30-40	40	50	50-60	60	60-70	70	70	80	80	100
b	30	30	30	30	30-40	40	40-50	50	50-60	60	60-70	70	70	80	80	100	100
c	100	80	70-80	60-70	70	70	70	70-80	80	80	80	80-100	100	100	100	200	200
+3.00a	25	25	25	25	30	30	30-40	40	50	50-60	60	70	70	70	80	80	100
b	40	30-40	30	30-40	40	40	50	50	60	60	70	70	70-80	80	80	100	100
c	200	100	80	70-80	70-80	80	80	80	80	80-100	100	100	100	100	200	200	200
+3.25a	30	30	25	30	30	40	40	50	50	60	70	70	70	70-80	80	80-100	100
b	40-50	40	40	40	40	40-50	50	50-60	60	60-70	70	70	80	80	80-100	100	100-200
c	200	200	100	80	80	80	80-100	100	100	100	100	100-200	200	200	200	200	200
+3.50a	30	30	30	30	30	30	40	40-50	50	60	60-70	70	70	80	80	100	100
b	50	50	40-50	40	50	50	50-60	60	60	70	70	70-80	80	80-100	100	100	200
c	200	200	200	100	100	100	100	100	100	100-200	200	200	200	200	200	200	200
+3.75a	40	30-40	30	30	30	30	40	50	50-60	60	70	70	70-80	80	80-100	100	100
b	60	50-60	50	50	50	50-60	60	60	70	70	70-80	80	80	100	100	100-200	200
+4.00a	40-50	40	30	30	30	30-40	40-50	50	60	60-70	70	70-80	80	80-100	100	100	100-200
b	70	60	50-60	50	50-60	60	60	70	70	70-80	80	80	100	100	100-200	200	200
+4.25a	50	40-50	40	30	30	40	50	50-60	60	70	70-80	80	80	100	100	100-200	200
b	70-80	70	60	60	50-60	60	60-70	70	70	70-80	80	80	100	100	100-200	200	200
+4.50a	60	50	40	30	30-40	40-50	50	60	60-70	70	80	80	100	100	100-200	200	200
b	80-100	70-80	60-70	60	70	70	70	80	80	80	100	100	100-200	200	200	200	200
+4.75a	70	50-60	40-50	40	40	50	50-60	60-70	70	70-80	80	80-100	100	100	200	200	200
b	100-200	80-100	70-80	70	70	70-80	80	80	80-100	100	100	100-200	200	200	200	200	200
+5.00a	70	60-70	50	40	40-50	50-60	60	70	70-80	80	80-100	100	100	200	200	200	200
b	200	100	80	70-80	80	80	80-100	100	100	100-200	200	200	200	200	200	200	200

Composite chart of refractive state to V.A. Derived from Peter's multiple tables. All figures are the denominator of the Snellen Fraction, whose numerator is 20/. Where given, a indicates age group from 5 to 15; b indicates age group from 25 to 35; c indicates age group from 45 to 55. Where not indicated, data applies to all ages. Above +3.50 sphere, acuity for c group poorer than 20/200 for all errors.

From Borish, Irvin M. Visual Acuity. Clinical Refraction, 3rd ed. 1970. Butterworth-Heinemann. Stoneham, Mass.

FIGURE XI-6
Sample Soft Contact Lens Examination Form

SAMPLE

SOFT CONTACT LENS (SCL) DATA SHEET FOR PEACE OFFICER CANDIDATES

TO QUALIFY FOR THE JOB OF PATROL OFFICER, YOU MAY BE REQUIRED TO WEAR SCLs. WE DO NOT ACCEPT USE OF HARD OR "SEMI-RIGID" LENSES DUE TO GREATER RISK OF HAVING THE LENS POP OUT OF THE EYE. PLEASE SUBMIT A CURRENT EYE EXAMINATION (WITHIN THE LAST THREE (3) MONTHS) FROM YOUR PRIVATE OPTOMETRIST OR OPHTHALMOLOGIST THAT INCLUDES ALL OF THE FOLLOWING INFORMATION:

a. When did patient begin using SCLs: _____

b. Date last pair of lenses dispensed: _____

c. Condition of current lenses: _____

d. Is there a history of any difficulties with SCL use?: _____

e. Date of last full examination of eyes: _____

f. Uncorrected distant visual acuity: OD = 20/ _____ and OS = 20/ _____

g. Corrected distant visual acuity with current contacts: OD = 20/ _____ OS = 20/ _____

h. Refractive error: OD = _____; OS = _____

i. Please list all prescription and OTC medications: _____

j. Does the patient have any of the following conditions:

_____ Dry Eyes	_____ Rosacea
_____ Scleroderma	_____ Rheumatoid Arthritis
_____ Sjorgen's Syndrome	_____ Lupus
_____ Diabetes	_____ Epilepsy

k. Statement of any medical contraindication to continued wearing of SCLs.

_____

l. Doctor's Name: _____

Doctor's Signature: _____

Office Address: _____ Phone Number: _____

2) RADIAL KERATOTOMY

a. GENERAL CONSIDERATIONS

Refractive surgery to correct myopia has been used as an alternative to lenses. Radial keratotomy (RK) is the most common technique; it involves cutting a set of 4-8 spoke-like shallow incisions on the cornea, beginning just outside the pupil and running out toward the limbus. The incisions weaken the sides of the cornea and make the central portion flatter.

Several long-term follow-up studies of this procedure have shown that most who have undergone this procedure are able to see adequately without correction. The largest study is the ongoing Prospective Evaluation of Radial Keratotomy (PERK) which has followed about 400 individuals for five years. At five years after surgery, 65% of PERK participants reported not needing to wear glasses (Waring, et al., 1991).

The acceptability of RK for patrol officer candidates depends on the following four considerations:

1) Post-RK impairment of visual function: About 3% of individuals experience a loss of two or more lines of best spectacle-corrected visual acuity (Waring, et al., 1991). However, candidates with unacceptable corrected vision can be readily identified during routine vision testing.

   Of greater concern are problems that are difficult to detect with routine testing, such as glare disability and impaired vision under dim conditions (Atkin, et al., 1986). The prevalence and severity of these problems is unknown. In addition, many individuals report the presence of "starbursts" - radiating lines around focal light sources such as headlights or street lights. This is thought to be due to the scattering of light from the portion of the radial scars that extend over the dilated pupil (Waring, et al., 1991). Most individuals report that this does not interfere with their normal activities, but some have stated that it severely disrupts their night driving ability.

   Candidates who have had RK should be carefully questioned regarding glare, starbursts, and difficulty with night vision. Specific tests of glare disability and contrast sensitivity exist, but are not as readily available nor as well stan-dardized as those for far acuity. However, the optometric or ophthalmology department of any major university should be able to assist in locating a site where these tests are conducted.

2) Stability of the uncorrected vision within 2-3 years: Deterioration back to unacceptable levels within 2-3 years can occur due to either loss of surgical correction (increasing myopia) or surgical overcorrection (progressive hyperopia).

Significant loss of surgical correction ultimately occurs in about 25% of RK patients (Waring, et al., 1990). However, in 85% of these cases, the failure of the procedure is evident within the first six months after surgery (Waring, et al., 1990). After six months, the probability of developing -1.00 D or more of myopic error is only 4% within the next 3.5 years (Waring, et al., 1990).

In contrast, surgical overcorrection does not usually begin to develop until 6-12 months after the procedure. Between 6-12 months, 22% of patients will have an MR change of +0.50 D or more (Waring, et al., 1985). From 1-4 years post-op, 15-31% of patients will experience a change of +1.00 D or greater (Waring, et al., 1990; Deitz, et al., 1986). It is not known whether progressive hyperopia ever ceases. For this reason, the PERK study was extended to 10 years.

Whether this progressive hyperopia will become clinically significant in the near future depends on the age of the candidate and how rapidly the hyperopia is developing. As illustrated in Table XI-13, the optic lens of younger persons can compensate for a large amount of hyperopia by increased accommodation. Consequently, it is very unlikely that persons under the age of 35 will have their far acuity impaired by progressive hyperopia. However, in older candidates, observation of the rate of progression can be used to estimate when the candidate would be expected to exceed a given uncorrected far acuity threshold. The accuracy of these estimates is questionable, however, since there is approximately a five line variation in far visual acuity for a given refraction in post-RK patients (Rice, et al., 1985).

3) Stability of the uncorrected vision during a work shift: For reasons that are not well understood, post-RK patients commonly complain that their vision becomes progressively worse later in the day. In the PERK study, 47% of the participants reported moderate-to-severe diurnal changes at one year after surgery (Schanzlin, et al., 1986). A later study found that diurnal fluctuation remained a problem even 2-4 years after surgery (Santos, et al., 1988).

Schanzlin, et al. (1986) studied 63 of the PERK participants who complained of diurnal variation by testing their MR, Snellen acuity, and corneal shape at both 7:00-8:00 a.m. and 7:00-8:00 p.m. at one year post-op. In 42% of the participants, MR changed by -0.50 D or more from morning to evening; 24% lost at least two lines of Snellen acuity, and in 39% the cornea was observed to be significantly steeper (0.50 D or more) in the morning. The authors were surprised to find one or more of these changes in only 63% of the participants, all of whom were symptomatic. This discrepancy indicated that traditional definitions of "clinically significant" changes may be too stringent in post-RK individuals. The authors also found no significant correlation between increased minus power of the MR and decreased visual acuity. This observation is consistent with that of Rice, et al. (1985) who noted that it is very difficult

to predict visual acuity based on refraction in those who have undergone RK.

In summary, it appears that diurnal variation is very common in those who have undergone RK, and that screening for this complication using traditional cutpoints for clinically significant changes has a sensitivity of only 63% (24% if only a Snellen chart is used and a two-line difference is required). For this reason, record review is essential when evaluating this potential complication in an RK candidate. Any complaints of diurnal variation reported to the candidate's private doctor can be taken as sufficient proof that this problem exists, even if not confirmed by objective testing.

4) Risk of significant eye trauma: RK incisions sever the stromal collagen fibrils and break their connection from limbus to limbus. Since the scars that heal the incisions do not reconnect the fibrils end to end, some authors have speculated that there may be a permanent loss of the structural integrity of the cornea. Although no formal studies of corneal rupture following RK have been conducted, there have been at least two cases of rupture during traffic accidents approximately two years after successful surgery (Schanzlin, et al., 1986). In a possibly related case, an individual complained of decreased visual acuity after being struck in both eyes during a fight (Waring, et al., 1991).

   It is unknown whether the probability of corneal rupture with trauma is significantly elevated. However, since a rupture is a catastrophic injury, hiring agencies may wish to consider the frequency with which their officers are struck in the eye before adopting standards on RK.

SUMMARY: It appears that radial keratotomy should be considered an acceptable method of visual correction for candidates, except perhaps at agencies where officers experience an extremely high number of eye traumas. However, the studies cited above support requiring RK candidates to meet the following conditions:

- All post-op records must be submitted for review;
- No significant difficulty with glare or night vision;
- Minimum deferral of 6 months post-op for candidates < 35 years old, or 12 months for those age 35 or more;
- No indication that uncorrected far acuity will be significantly degraded within the next 2-3 years by progressive hyperopia;
- No significant diurnal instability in visual testing or function.

A final note on RK: The above cited studies are based on surgeries performed in the early and mid-80's. Subsequent improvements in surgical techniques may result in better prognoses. Additionally, new procedures are under development and may be widely available in the near future. For example, excimer lasers are now being used to precisely "shave" and sculpture the outer layer of the cornea. In another technique, solid state lasers can create vacuoles within the stroma, and depending on their controlled collapse, change corneal shape. These new procedures may result in more predictable results and fewer complications. However, this must be demonstrated by well-designed prospective studies.

b. RECOMMENDED EVALUATION PROTOCOL

The physician must carefully question the candidate about problems regarding glare, starbursts, night vision, and diurnal variation. Dates of surgeries and any repeat procedures ("touch-ups") should be noted. All records related to the surgery and follow-up care should be obtained.

All post-RK candidates should be required to submit the results of a recent eye examination from a private vision specialist. If possible, this exam should be conducted by the same individual who tested the candidate in the past. At a minimum, testing should include measurement of uncorrected and corrected far acuity, and manifest refraction in the early a.m. and late p.m. (O.S., O.D., O.U.). The candidate's vision should meet applicable standards at all times of day. Additional testing for glare disability and contrast sensitivity should be requested, if available. Candidates with hyperopia should have their near vision tested, especially if they are in their late 30's to early 40's.

After this information is obtained, the physician should evaluate whether the candidate fulfills all of the following criteria for unrestricted duty:

- **The last surgical procedure on either eye (including touch-ups) was at least 6 months ago for candidates <35 years old, or 12 months ago for those age 35 or older.**

- **The candidate currently meets all standards for objective testing of far acuity at all times of the day** (see Far Acuity Deficiency).

- **There is no significant difficulty with glare or night vision based on review of records and history or specialized test results if available.**

- **There is no significant diurnal instability in visual testing or function.** The generally accepted criteria for significant visual instability is either a change of greater than one line (or 5 characters) of far acuity, or a change of 0.50 D (or more) in an individual's MR. However, since these objective criteria have limited sensitivity in detecting even moderate to severe diurnal fluctuation in visual function (Schanzlin, et al., 1986), documentation of complaints in medical records should be given greater weight than the results of current testing.

- **Uncorrected far acuity will not deteriorate below acceptable standards within the next 2-3 years due to progressive hyperopia.** The physician can estimate the projected MR in 2-3 years by using measurements of the candidate's MR at a minimum of two points in time (three points are preferable) and assuming a straight-line function. Table XI-13 can be used to convert this projected MR into approximate far acuity.

Example: A 35 year-old candidate had RK in January, 1992. In the immediate post-RK period, he was undercorrected, but at six months post-op, his MR was [+0.25]. At twelve months post-RK, his MR was [+1.25] with an acuity of 20/20. The evaluating physician concludes that the candidate has progressive hyperopia, since a change in MR of 0.50 D or more has been documented. At this rate of change (+1.00 D/6 months), the physician estimates that the candidate's MR could potentially "overcorrect" to a level of [+4.25] to [+6.25] in the next 2-3 years. This level of hyperopia would likely correspond to an uncorrected far acuity of between 20/70 to > 20/200. If the hiring agency had an uncorrected standard of 20/40, it would be concluded that the candidate has a condition which is likely to cause significant impairment in the immediate future. However, the candidate is encouraged to seek a re-evaluation in six months. At that time, the physician would be able to reassess the progression of the hyperopia. If it has slowed significantly, the physician may be able to deem the candidate acceptable.

Note: Caution must be exercised when using these estimates, since there is approximately a five line variation in far visual acuity for a given refraction in those who have undergone RK (Rice, et al., 1985).

Candidates with unsuccessful RK who wish to apply for an SCL waiver should be evaluated using the agency standards for both RK and SCL use. Specific examination for neovascularization of the incisional scars should also be conducted. Vascularization of one or more scars for at least 25% of its length is considered significant (Waring, et al., 1991), and probably a contraindication to continued SCL use. Progressive hyperopia should also be considered a contraindication to SCL use, since this condition may be exacerbated by SCLs (Edwards & Schaefer, 1987).

3) VISUAL FIELD DEFICIENCY

a. GENERAL CONSIDERATIONS

Partial loss of visual field in one or both eyes affects about 3% of the population between the ages of 16 to 60 (Johnson & Keltner, 1983). The incidence rate increases to about 6% between the ages of 61 to 65, and to 13% in persons over the age of 65. A large number of eye conditions can cause loss of visual field, the most common being glaucoma.

The 1984 POST vision survey indicated that peripheral vision is one of the most important visual abilities for safe patrol officer performance (Table XI-1). Examples of critical situations in which peripheral vision would be important include:

- a suspect approaching the officer from the far right or left side;
- a hostile crowd surrounding an officer;
- an officer attempting to look out of the side of a patrol car to spot a suspect while still controlling the vehicle;
- driving under emergency conditions.

Several studies have examined the performance of persons with visual field defects in situations similar to those cited above. Johnson, et al. (1992) tested the impact of glasses that restrict peripheral vision on the ability of a correctional officer to detect suspicious behavior by inmates gathered in a day room. Restricting the binocular horizontal field to 120 degrees in each eye had no impact, but further restriction to 60 degrees significantly impaired performance.

Visual Field Defects in Both Eyes. Although research conducted in the 1960's and 1970's failed to show any relationship between visual field loss and driving safety, more recent studies using better testing techniques have yielded different results. Johnson and Keltner (1983) found that accident and conviction rates of drivers with visual field loss in both eyes were more than twice as high as those with normal visual fields. This finding is consistent with a study by Hedin and Lovsund (1987) who tested individuals with driving simulators. He found that 85% of 27 patients with a variety of field defects had significantly decreased reaction times to stimuli presented in visual areas of relevance to traffic safety. Even though participants were free to move their heads during testing, only 4 (15%) could compensate for their field defects. The Federal Department of Trans-portation currently requires commercial drivers to have a horizontal field of at least 140 degrees.

Visual Field Defects in One Eye. Johnson and Keltner (1983) found slightly, but not significantly higher accident rates among drivers with unilateral field defects or monocularity. However, these drivers' visual defects were rated as

severe in only 13% of the drivers with unilateral defects. The results of studies that have focused on monocular drivers or those with gross reductions of the visual field on one side have generally been significant. Kite and King (1961) observed a seven-fold increase in intersection crashes and pedestrian injuries. Keeney (1968) found that monocularity was four times more common in those cited for multiple driving violations. Moreover, a pathology study found long-standing ocular lesions on the same side as seven fatal injuries in two drivers and five pedestrians killed in Maryland (Freytag & Sachs, 1969).

SUMMARY: The evidence indicates that **the presence of either monocularity or significant bilateral field defects in a patrol officer would create a direct threat of harm to self or others. Significant field defects would include cases in which horizontal binocular field is restricted to < 120 degrees in each eye, total vertical field is less than 100 degrees, or when large scotomas are present.**

It is relevant to note that similar peripheral vision standards were upheld in a 1988 case heard by the California Fair Employment and Housing Commission involving a monocular police officer candidate (DFEH v. City of Merced PD, FEP85-86, 88-20). In finding for the city, the Commission agreed that "peripheral vision is among the most important visual abilities that a police officer needs to safely fulfill his or her duties," and that safety concerns were not mitigated by that candidate's seven years of prior experience as a patrol officer.

b. RECOMMENDED EVALUATION PROTOCOL

Due to their low sensitivity and specificity, pre-employment screening techniques for visual field defects cannot be recommended for routine testing. Clinical confrontation field testing has been shown to have a sensitivity of only 50% (Johnson & Baloh, 1991). Therefore, reliable detection of a visual field defect requires formal perimetry testing by a vision specialist, which would be expensive to administer to all candidates.

An alternative approach is to require formal perimetry testing only for candidates at high risk. This would include candidates with either a personal or family history of glaucoma, any eye problem other than refractive error, or decreased visual acuity (worse than 20/40) in either eye which cannot be corrected with lenses.

Candidates with monocular vision, <120 degrees of total horizontal field in each eye, <100 degrees of vertical field, or significant scotoma would create a direct threat of harm as patrol officers, and therefore should be restricted from field duty.

4) BINOCULAR FUSION DEFICIENCY

a. GENERAL CONSIDERATIONS

Normal binocular vision requires that both eyes be focused or fused on the same point in space. A strabismus is said to exist when the eyes are directed at different points. The resulting diplopia and visual confusion become the stimuli for suppression of the deviated eye, and if not treated at a young age, can result in permanent loss of vision in the deviated eye (amblyopia). The eye may be intermittently or constantly turned inward (esotropia), outward (exotropia), or even vertically deviated (hypertropia). Strabismus is observed in about 6-7% of children.

Stereopsis, which is a component of binocular fusion, is necessary for depth perception--an important visual ability for patrol officers (Table XI-1). Job-related tasks that involve stereopsis can include subduing combative suspects, driving, weapon loading under emergency conditions, and other tasks requiring judgement of the relative depth and location of objects, especially objects situated within 20 feet of the officer. It should be noted, however, that depth perception is possible using monocular cues only (Von Noorden, 1990). These cues include motion parallax (further objects move more than closer objects with head or eye motion), linear perspective (distant objects are smaller), the overlay of contours, the distribution of highlights and shadows, and the size of known objects (bigger means closer). What is not known, however, is the effectiveness of these cues in stressful situations. Using monocular cues involves judgement based on experience, and the cues must be present in abundance. Consequently, errors are possible.

Experimental studies involving individuals tested with one eye occluded have also found that adequate binocular fusion provides a "binocular summation" advantage for performing a number of tasks relevant to police work. For example, Jones and Lee (1981) found that detecting a camouflaged object required 55% longer when one eye was occluded. Tracking a moving target was 22% more efficient with both eyes open. Lack of balance, as measured by body sway when one foot is placed in front of another, was 38% greater with one eye closed. Jones and Lee also found that monocular impairment was somewhat greater in dim light. This latter finding is consistent with a study by Groome and Johnson (1993) who observed that individuals could detect an approaching pedestrian in simulated fog conditions 12% more quickly with both eyes open, and especially by Rabin (1994) who found that binocular summation provides an increase in contrast sensitivity of approximately 40%.

There are no functional studies involving individuals with permanent loss of binocular fusion; therefore, the question of the degree to which experience can compensate for this visual defect remains largely unanswered. Sheedy, et al. (1986) addressed this issue experimentally by having individuals with normal

stereopsis undergo binocular occlusion for a period of five days. He found that monocular performance of three visual-motor tasks (placing pointers into straws, needle-threading, and card filing) significantly improved with practice over the five day period; the binocular advantage in performing these tasks decreased from an average of 18% to 12.4% by the end of the five-day period for the pointers and straws and the needle-threading tasks. However, binocular performance remained better than monocular performance throughout the duration of the study.

SUMMARY: Loss of binocular fusion could potentially impair the performance of essential patrol officer duties, although it is not entirely clear to what extent persons with long-standing loss of fusion can compensate for this impairment. Therefore, although further research is needed, **there appears to be evidence for requiring candidates to have a minimum degree of binocular fusion and stereopsis of approximately 40 seconds of arc.**

b. RECOMMENDED EVALUATION PROTOCOL

Normal binocular vision is considered 20 seconds of arc or better, which corresponds to achieving correct responses on all 9 Titmus Stereo Test targets. However, given the uncertainty regarding compensatory mechanisms in individuals with binocular fusion deficiencies, the recommended criterion for passing is 40 seconds of arc, or dot #6.

Candidates who initially test at less than 40 seconds of arc should be evaluated by their private vision specialist to establish the reason for the deficit if it is not readily apparent. In some cases, correction of near vision may enable the candidate to pass the Titmus test. However, it is not uncommon for a candidate to test poorly for no apparent reason (i.e., no amblyopia, strabismus, or phoria). In these cases, it is recommended that judgment be used in the interpretation of Titmus test results.

5) COLOR VISION DEFICIENCY

a. GENERAL CONSIDERATIONS

- Relevance to Patrol Officer Duties:

In the 1984 POST vision study, incumbent officers rated color identification as being "important" to "very important" (Table XI-1). Color vision was cited as being involved in an estimated 6% of critical incidents. Steward & Cole (1989) found that the most common critical incidents cited by patrol officers that require color vision involve the identification of vehicles and clothing (Table XI-14).

TABLE XI-14
Breakdown of Critical Incidents Involving Color Identification

Object	N
Vehicle	46
Suspect clothing	16
License plate	3
Container	2
Traffic light	1
Residence	1

From Steward, J.M. & Cole, B.L. 1989. What do color vision defectives say about everyday tasks? Optom. Vis. Sci. 66(5):288-295.

Color identification, especially of cars and clothing, is an important component of almost all patrol officer communications. For example, when someone calls 911 and reports a suspect or vehicle, the dispatcher generally asks the caller to describe identifying colors. The subsequent radio call to a patrol car includes this information.

In many jurisdictions, patrol officers must be able to write legal reports and testify in court regarding their observations. A jury would likely discredit the information from a color vision deficient (CVD) officer who is uncertain as to whether he saw a green car or a brown car leaving the scene of a crime, or whether a suspect had a tan or pink shirt.

Beyond color identification, color vision is also important in the recognition of signal illumination. Questionnaire results document that many CVD persons have difficulty distinguishing the color of traffic signal lights, confuse traffic lights with street lights, and have trouble seeing brake lights on cars (Table XI-15; Steward & Cole, 1989). Although it has not been shown that CVD drivers have higher total accident rates (Verriest, et al., 1980; Norman, 1980), CVD drivers appear to have relatively more accidents on road crossings controlled by traffic lights, more rear-end collisions caused by overlooking red rear, stop or warning lights, and more accidents in wet or slippery conditions (Verriest, et al., 1980).

TABLE XI-15
Percentage of Candidates Reporting Difficulty With Color When Driving

Question	Dichromats (N=37)	Anomalous Trichromats (N=65)	Color Normals (N=102)
Have you ever had difficulty distinguishing the color of traffic signal lights?	49**	18*	0
Do you ever confuse traffic lights with street lights?	33	31	2
Do you find brake lights on other cars difficult to see?	22	8	0
Do you find hazard or warning lights on temporary barricades difficult to see?	11	2	0
Do you find dashboard warning lights hard to see?	14	5	0
Do you find some road signs such as those on freeways or school crossings difficult to read?	5	11	0

Significant difference at *$p < 0.05$ or at **$p < 0.01$ using Yates x^2.

From Steward, J.M. & Cole, B.L. 1989. What do color vision defectives say about everyday tasks? Optom. Vis. Sci. 66(5):288-295.

- Classification of Color Vision Deficiencies:

The human eye has three different classes of cone photoreceptors, each with a unique photopigment that preferentially absorbs different wavelengths of light (red, green, and blue). The major classification of CVD depends on whether there is either: (1) an alteration of one of these pigments ("anomalous trichromats"); or (2) in worse cases, a total absence of a pigment ("dichromats"). CVD is further subclassified on the basis of which pigment is involved. "Protans" have a red receptor deficiency, "deutans" have a green receptor deficiency, and "tritans" have a blue receptor deficiency (Table XI-16).

For the vast majority of candidates with CVD, the condition will be of hereditary origin. However, CVD can be secondary to ocular/systemic disease (such as diabetes and glaucoma) or medications (Table XI-17). Clinical characteristics which suggest acquired CVD are presented in Table XI-18 (Bailey, 1991).

TABLE XI-16
Nomenclature, Classification, and Prevalence in Males (Females) of Different Types of Human Color Vision

Type		Percentage
Trichromatic		
Normal		92 (99.6)
Anomalous		
Protan (protanomalous)	Red-green	1 (0.01)
Deutan (deuteranomalous)	Red-green	5 (0.25)
Tritan (tritanomalous)	Blue-yellow	Trace
Dichromatic		
Protan (protanopia)	Red-green	1 (0.01)
Deutan (deuteranopia)	Red-green	1 (0.01)
Tritan (tritanopia)	Blue-yellow	0.002
Monochromatic		
S, M, or L cone (incomplete or atypical achromasy)		0.000001
Rod (typical achromasy)		0.003

From Bailey, J.E. Color vision. Chapter 13 In: Clinical Procedures in Optometry. J.B. Eskridge, J.F. Amos, J.D. Bartlett (eds). Lippincott, pp. 99-120, 1991.

TABLE XI-17
Examples of Some Commonly Prescribed Drugs Classified According to Color Deficiencies They Reportedly Induce

Blue Defect	Red-Green Defect
Chloroquine	MAO-inhibitors
Indomethacin	Chloramphenicol
Phenothiazine	Oral contraceptives
Methimazole	Ethambutol
Trimethadione	Digoxin

From Bailey, J.E. Color vision. Chapter 13 In: Clinical Procedures in Optometry. J.B. Eskridge, J.F. Amos, J.D. Bartlett (eds). Lippincott, pp. 99-120, 1991.

TABLE XI-18
Clinically Distinguishable Differences Between Acquired and Hereditary Color Vision Defects

Hereditary	Acquired
Always bilateral and equal	Usually more severe in one eye, often unilateral
Almost always a red-green deficiency; much more prevalent in males	Predominantly blue-yellow defects; males and females equally susceptible; can combine with hereditary defect
Other visual functions not affected	May affect visual acuity, visual fields, and other vision functions
Stable throughout life	Color vision varies with status of underlying condition; more stable if long-standing
Unambiguous color confusions on color vision tests	Often no clear-cut types of errors

From Bailey, J.E. Color vision. Chapter 13 In: Clinical Procedures in Optometry. J.B. Eskridge, J.F. Amos, J.D. Bartlett (eds). Lippincott, pp. 99-120, 1991.

- Assessing Functional Abilities:

The diagnostic classification of a CVD person has only limited usefulness in assessing functional capacities. About all that can be concluded is:

1) Persons who completely lack a pigment (dichromats) have more difficulty than those who have only a photopigment anomaly (anomalous trichromats); and

2) Protans appear to have more difficulty with driving than deutans (Verriest, et al., 1980; Cole & Vingrys, 1982).

Beyond these generalities, there exists a wide range of functional capacity among individuals within and between all classification groups. Consequently, the primary focus of most color vision tests is to individually assess functional capacity rather than to classify an individual's specific deficiency. The common tests include the following:

Pseudoisochromatic Plates (PIP): These tests require an individual to identify a number consisting of colored dots embedded in a background of different colored dots. The most common PIP test is the Ishihara test which consists of 15 plates. These tests are very good for quickly and accurately differentiating color "normals" from color "abnormals." One can reasonably conclude that the vast majority of persons who pass this test will not have any functional deficits. Unfortunately, 8% of male candidates will not pass this test. Assessing the functional ability of these individuals requires further testing.

Lantern Tests: These tests (such as the Farnsworth Lantern test) require the identification of small colored lights. They are commonly used to certify pilots and ship captains (Hackman & Holtzman, 1992). Some authors have advocated their use in determining whether CVD individuals should be allowed to drive commercially (Cole, 1991). However, the availability of testing equipment is extremely limited. Problems also exist with the establishment of pass-fail criteria for these tests.

Color Arrangement Tests: These tests require the individual to place colored samples (usually in the form of paper disks mounted in caps) in a logical color sequence. The most commonly used test is the Farnsworth D-15, which uses 15 caps. The advantages of this test are that it is well-standardized, readily available, inexpensive, relatively easy to administer and score, and has a high specificity. In fact, all or essentially all persons who fail the D-15 will have an impaired ability to name or distinguish differences in colors. The D-15 can also serve as relatively good substitute for a Lantern test in evaluating driving safety. Hackman and Holtzman (1992) found that 354 of 377 persons who passed the D-15 also passed the Farnsworth Lantern, while all 23 persons who failed the D-15 also failed the Lantern test.

The major limitation of the D-15 is its low sensitivity. For example, a POST color vision study (1984) demonstrated that a significant proportion of CVD persons who pass the D-15 test will still have some degree of functional deficit of relevance to patrol officer duties. A color simulation test was conducted in which participants were shown slides and asked to name the colors of specific vehicles, suspects' clothing, traffic lights, license plates, and to determine whether vehicles' brake lights were on or off. The results indicated that persons who failed both the Ishihara test and the D-15 made significantly more errors than color normals in most color naming and all driving related color-dependent tasks (Table XI-19). Those who failed the Ishihara but passed the D-15 made fewer errors on all tasks than those who failed both tests; however, their error rate was almost twice that of color normals when naming the color of cars, and almost three times that of color normals when naming the color of clothing.

The results of the POST study are corroborated by experience at other institutions. At the U.C. Berkeley School of Optometry, it has been observed that some individuals who receive a borderline pass on the D-15 test have difficulty naming some pastel colors (Zisman & Adams, 1985). At the City of Los Angeles, candidates who pass the D-15 are asked to name colors from a paint catalog. Those who make errors on the paint test are taken outside and asked to identify the colors of approximately 25-40 common objects such as cars, clothes, and houses. Among twenty-four consecutive candidates tested, thirteen individuals (54%) have made more than 1 color-naming error; six of these candidates (25%) misidentified 8 objects or more within a testing period of approximately thirty minutes (Goldberg, 1994).

TABLE XI-19
POST Color Simulation Test Results

Color-Dependent Task	Color Normals (n=19)	Fail Ishihara Pass D-15 (n=6)	Fail Both Tests (n=6)
	Number of Slides Misidentified		
Color Naming:			
Vehicles (20)*	4.7	8.9**	11.0**
Clothing (11)	1.0	2.7**	5 .8**
License plate (5)	1.8	1.4	2.5
Driving-Related:			
Brake lights (24)	2.7	1.8	7.4**
Traffic lights (20)	0.8	1.3	5.4**

*Total number of simulation slides; average number identified incorrectly is shown in table
**Significantly worse than normals by t-test

More complex and difficult color arrangement tests than the D-15 are available. The Farnsworth Munsell 100 Hue test, for example, can quantitatively score an individual's color aptitude. However, this test is normally used to demonstrate superior color aptitude among color normals rather than predict functional problems among those with color deficiencies. In addition, the test takes 45-60 minutes to administer and score.

Color Naming Tests: Color-naming tests offer the most content validity of any color vision test, since they directly assess a job skill. Unfortunately, the only commercially available color-naming test is the Dvorine test, which consists of a color wheel with just sixteen colors. The low number of colors limits the sensitivity of this test, and pass-fail criteria are not established. To increase sensitivity, the City of Los Angeles developed a color naming test in which candidates are asked to identify colors from an industrial paint catalog containing 120 colors. Although there are no strict pass-fail criteria, responses are compared to those of a group of 20 normal controls. Candidates are considered to be impaired if they demonstrate consistent and frequent errors. In borderline cases, the candidate is taken outside and asked to rapidly identify the colors of parked or passing cars and the colors of clothing worn by various pedestrians.

Although the addition of a color-naming test can improve the sensitivity of color vision assessment, the test's positive predictive value (i.e., the percent of individuals who fail the test and who truly have a functional problem) depends on how strictly the test is interpreted. It is imperative that the test results of CVD candidates be standardized against the responses of color normals. It is not uncommon for color normals to give varying responses to shades of certain colors.

SUMMARY: Patrol officers require adequate color vision in order to identify cars, clothing and other items, as well as to detect and distinguish traffic lights, street lights, and related highway lights. However, those with mild color vision deficiencies have been found to have sufficient color identification and discriminatorial skills to perform as a patrol officer. **Therefore, candidates who fail the PIP test should be administered the Farnsworth D-15. Those who fail the D-15 should be restricted from field duty requiring color identification and discrimination.**

The sensitivity of the D-15 can be improved by requiring additional testing of color-naming abilities. However, due to problems with standardization in test administration and score interpretation, use of in-house color naming tests is not recommended for most agencies.

- Corrective Lenses:

Some optometrists or physicians will dispense a rose-colored contact lens ("X-Chrom" lens) to persons with CVD. When worn in one eye, the lens will allow a person to pass a pseudoisochromatic plate test because the lens introduces a brightness difference between the figure and the background. The effect is equivalent to looking at the plates through a red filter and violates the basic illumination requirements for the test. In fact, Matsumoto, et al. (1983) found that performance on other color vision tests may be worse, discrimination of colors not previously confused may be poorer, and stereopsis impaired.

b. RECOMMENDED EVALUATION PROTOCOL

Candidates who fail the screening PIP test should undergo a detailed history and be administered a Farnsworth D-15 test.

HISTORY - An excellent set of questions can be found in Tables XI-15 and XI-20. Any admission by the candidate of color vision problems will lend support to a decision to assign job restrictions. However, a failure to acknowledge problems does not negate the findings of objective testing. A recent study found that 5% of dichromats and 25% of anomalous trichromats were not aware of their CVD (Steward & Cole, 1989). In certain cases, the physician may want to consider whether the CVD is non-hereditary and potentially reversible (see Tables XI-17 & XI-18). This is especially important if the CVD candidate is taking medication, female, or if the deficiency follows a tritanopic pattern.

D-15 TEST - Illumination is critical for this test and should be equivalent to that used for the PIP test (see Routine Testing - Color). The D-15 test should be illuminated from above at an angle of about 90°, and the viewing angle should be at about 60°. After opening the box containing the colored caps, the loose caps should be removed from the tray, placed in front of it, and then intermixed. Candidates should be observed during

testing and should not be allowed to pre-sort the caps before placement in the testing tray.

The following set of instructions to the candidate is recommended: "Select the cap that looks most like this fixed cap (point to D-15 panel "pilot" cap) and place it next to it. Next, select from the remaining loose caps the one most like the cap you just placed in the tray and put it next to that one. Continue until all the caps are in the box. You may rearrange the caps, if you wish, so that a regular series is formed between the end caps."

Candidates should be allowed as much time as necessary to complete the test; however, it is helpful to suggest a time limit.

The conventional criteria for failing is two or more major crossings in approximately the same direction on the scoring diagram (see Figures XI-7 - XI-13). A major crossing requires that caps be placed at least four numbers apart, as would occur if cap 7 were placed next to 11. Normal patterns include no errors, or patterns in which caps are arranged in reverse order following a crossing (see Figures XI-7, XI-8, and XI-9). Candidates who fail the test should be allowed to immediately repeat it. The results should be fairly reproducible.

Candidates who consistently fail the D-15 and whose impairment is not reversible should not be permitted to perform tasks that require rapid and accurate color identification, nor allowed to engage in high-speed emergency driving.

TABLE XI-20
Percentage of Individuals Reporting Difficulty With Everyday Tasks That Involve Color

Question	Dichromats (N=37)	Anomalous Trichromats (N=65)	Color Normals (N=102)
Have you ever had any difficulty in selecting the colors of clothes, accessories, cars, paints, carpets, furniture, wallpaper, or cosmetics?	86**	66*	0
With craft work and hobbies, do you have any trouble distinguishing the colors of wires, threads, materials, wools, paints, or other things?	68***	23***	0
Do you find plant or flower identification difficult because of color?	57***	18***	0
Do you have any difficulty determining when fruits and vegetables are ripe by their color?	41*	22*	0
Can you determine if meat is cooked by its color?	35*	17*	0
Do you have any difficulties because of color as either a spectator or participant in sporting activities?	32	18	0
Do you find it difficult to adjust the color balance on a color TV satisfactorily?	27	18	2
Have you ever had difficulty in recognizing skin conditions such as sunburn and rashes?	27	11	0
Have you ever taken the wrong tablet or medicine because of difficulties with its color?	0	3	0

Significant difference between dichromats and anomalous trichromats at $*p < 0.05$ or at $***p < 0.002$ using Yates x^2.

From Steward, J.M. & Cole, B.L. 1989. What do color vision defectives say about everyday tasks? Optom. Vis. Sci. 66(5):288-295.

FIGURES XI-7 -- XI-13 Normal and Color Defective Response Patterns on the Farnsworth D-15

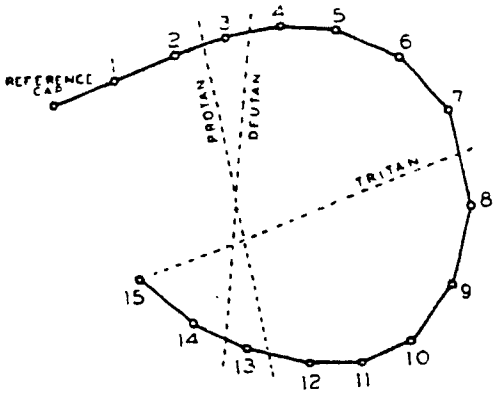


Figure XI-7 -- Normal Vision -- No Errors

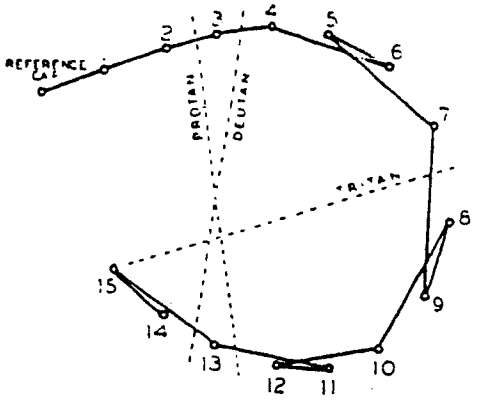


Figure XI-8 -- Normal Vision -- Minor Errors

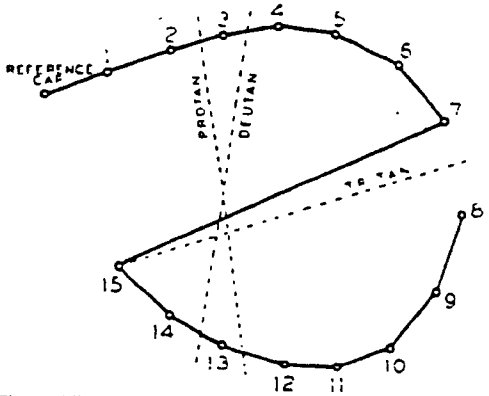


Figure XI-9 -- Normal Vision -- One Error (See Text)

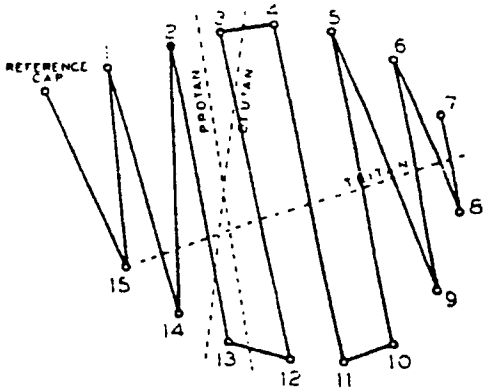


Figure XI-10 -- Defective Vision -- Red Blindness (Protanopia)

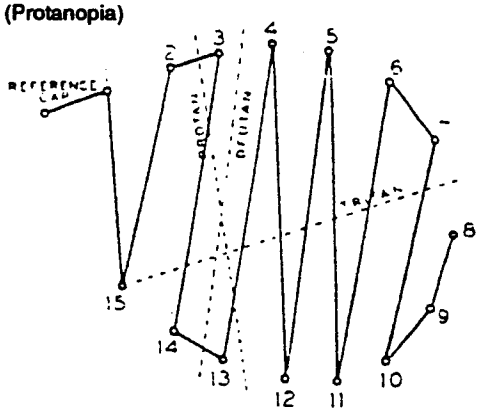


Figure XI-11 -- Defective Vision -- Green Blindness (Deuteranopia)

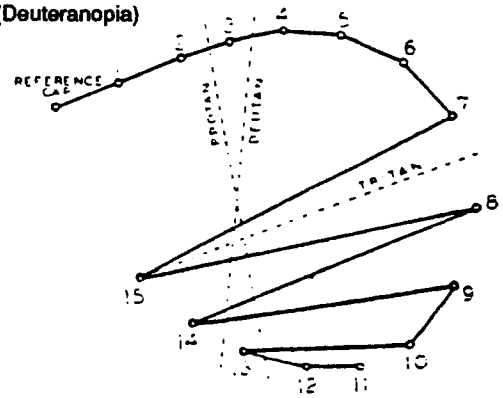


Figure XI-12 -- Defective Vision -- Blue Blindness (Tritanopia)

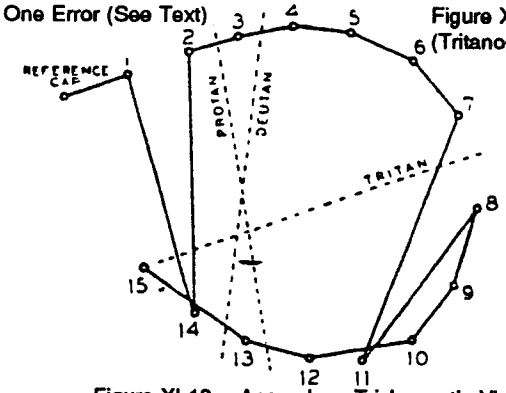


Figure XI-13 -- Anomalous Trichromatic Vision

From Farnsworth, Dean. 1947. The Farnsworth dichotomous test for color blindness panel D-15 manual. Psychological Corporation, NY.

SUMMARY OF VISION GUIDELINES

The vision guidelines are briefly summarized below. However, before using these guidelines in the development of agency-specific vision standards, it is important to read the discussions of these issues found in the respective sections. Page numbers where these discussions are located are indicated in parentheses.

1. **FAR ACUITY** (XI-8 - XI-37)

Corrected Vision: (XI-8 - XI-14)

- Best corrected vision of 20/20.
- Best corrected vision should be assessed for **both** eyes together.

Use of Glasses: (XI-15 - XI-23)

- Due to the likelihood of dislodgement or breakage, candidates who wear glasses should meet an uncorrected far acuity standard of between 20/40 - 20/100. The exact far acuity standard selected should be based on agency-specific considerations such as:
  - The likelihood and circumstances surrounding the use of firearms at that agency (e.g., distances of targets, frequency of foot pursuits in conjunction with weapon use)
  - The likelihood of engaging in combative situations
  - Deployment of one officer patrol units
  - Inclement weather, night shift duty, and other environmental conditions that may affect visibility with glasses

Use of Contact Lenses: (XI-23 - XI-29)

- Use of soft contact lenses (SCLs) is permissible by candidates who have at least one year of successful SCL use, and provided that the agency uses pre-placement agreements and has a monitoring program in place.
- SCL use is preferred over the use of other types of contact lenses (i.e., rigid gas permeable or hard lenses) due to concerns of particle entrapment and dislodgement.
- The establishment of an uncorrected vision standard for SCL wearers should be an agency-specific risk management decision. However, should an agency decide to create an uncorrected standard, it is recommended that it be no more stringent than 20/200 (both eyes).

Use of Orthokeratology: (XI-30 - XI-31)

- Due to concerns over fluctuating vision, particle entrapment, and the inability to monitor compliance, the use of SCLs are preferred over ortho-K lenses. At a minimum, ortho-K wearers should be required to always wear lenses on duty and meet all requirements established for contact lens wearers.

Evaluation Protocol: (XI-32 - XI-37)

2) RADIAL KERATOTOMY (XI-38 - XI-42)

- All post-op records must be submitted for review.
- No significant difficulty with glare or night vision.
- Minimum deferral of 6 months post-op for candidates < 35 years old, or 12 months for those age 35 or more.
- No indications that uncorrected far acuity will be significantly degraded within the next 2-3 years by progressive hyperopia.
- No significant diurnal instability in visual testing or function.

3) VISUAL FIELD DEFICIENCY (XI-43 - XI-44)

- Formal perimetry testing should only be conducted on high risk candidates, such as those with either a personal or family history of glaucoma, eye problems other than refractive error, or decreased visual acuity in either eye which cannot be corrected with lenses.
- The results of those who undergo formal perimetry should indicate:
    - A minimum of 120 degrees of total horizontal field in each eye.
    - At least 100 degrees of vertical field.
    - No significant scotomas.

4) BINOCULAR FUSION DEFICIENCY (XI-45 - XI-46)

- Candidates should demonstrate a minimum stereopsis of at least 40" of arc by achieving a score of 6 or better on the Titmus Stereo Test.

5) COLOR VISION DEFICIENCY (XI-47 - XI-56)

- Candidates who fail the PIP test should be required to pass the Farnsworth D-15.
- Use of rose-colored lenses (i.e., "X-Chrom") should not be permitted during testing.

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HEARING GUIDELINES[1]

I. INTRODUCTION

It would be difficult to overstate the importance of hearing to the conduct of essential patrol officer job functions. This is a hearing-critical job, where the ability to hear, discriminate, localize and respond appropriately to a variety of speech and environmental sounds may literally mean the difference between life and death. These guidelines are intended to ensure that officers have the hearing ability necessary to protect themselves, their fellow officers, and the public. This update incorporates the latest developments in the assessment of auditory function. Additional depth and detail are provided to enable physicians and hiring authorities to establish guidelines that are fair and consistent, and to allow for the individualized consideration of agency and candidate specifics.

A. OUTLINE OF HIGHLIGHTED CONDITIONS

1) Abnormal Audiogram

2) Use of Hearing Aids

3) Retrocochlear conditions

B. IMPORTANCE OF HEARING TO PATROL OFFICER DUTIES

Analyses of the hearing demands of patrol officers have consistently demonstrated the importance of many hearing capacities to the successful performance of patrol officer essential functions. Officers must be able to adequately receive, perceive, and react appropriately to speech communication in a variety of situations, including face-to-face communication, radio communication and telephone conversations. They must also be able to recognize and respond appropriately to nonverbal auditory stimuli, such as the sound of a shotgun racking, retreating or approaching footsteps, or the sound of breathing.

POST has conducted several studies to identify and validate the hearing demands of patrol officers. The first such study, conducted in 1979, gathered data from more than 2,400 subject matter experts across 219 law enforcement agencies.

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[1] Author: R. Leonard Goldberg, M.D.
Participating Specialists: Donald Dirks, Ph.D., Marc Kramer, Ph.D., Don Morgan, Ph.D., Sigfrid Soli, Ph.D., J.C. Spottswood, J.D., M.P.H., Robert W. Sweetow, Ph.D., Colonel Nancy L. Vause, Steve Weyers, M.D.

Many hearing-related job tasks were rated as either very or critically important, including transmitting messages over police radios, interrogating suspects, coordinating tactical operations, and confronting hostile groups.

In 1984, POST conducted a second job analysis, which included 131 officers from seven agencies. These officers were asked to rate 13 hearing-related tasks for importance and frequency of occurrence in various background noise conditions. The tasks were grouped into four major categories: speech comprehension, sound localization, sound detection, and sound recognition. Tasks requiring speech comprehension, such as monitoring radio transmissions and conversing face-to-face, were rated very important to critically important, and occurred daily (Table XII-1). Many officers also rated tasks involving sound localization and sound detection as critically important, noting that these tasks occurred several times a week. Tasks involving sound recognition were rated as "important" to "very important" and occurred on a weekly basis. Moreover, all tasks had to be performed in a wide range of background noise environments from silence to wailing sirens and screaming mobs.

POST also asked each officer to provide information about a critical incident in which the ability to hear was particularly important. A total of 99 such incidents were reported: 29% involved sound detection, 28% sound localization, 21% speech comprehension, and 10% sound recognition. Of the 99 incidents, 15 occurred in quiet environments.

Based on this 1984 study, one can conclude that tasks involving speech comprehension, sound localization, sound detection, and sound recognition in a wide range of acoustic environments are essential job functions for patrol officers.

In support of the current guidelines, POST convened a 1998 job analysis panel meeting consisting of seven senior field-training officers representing police departments, sheriffs' offices, and the California Highway Patrol. These subject matter experts were given the task of reviewing and updating the information from the 1984 study. They rated the resulting hearing tasks on frequency and importance, and identified common background noises encountered during their execution. As in 1984, panelists provided critical incidents associated with each of the major hearing functions (speech comprehension, sound localization, sound detection, and sound recognition).

The results of this analysis (summarized in Table XII-2) confirmed the previous findings: namely, that all major hearing functions are critical to the safe and effective performance of a wide variety of essential patrol officer functions; and, furthermore, that these functions must be performed in the midst of a wide range of often adverse acoustical environments. The ability to comprehend speech, especially in the midst of moderate-to-loud background noise (e.g., freeway traffic, radio static) is clearly one of the most critical hearing skills for a patrol officer.

TABLE XII-1:
Hearing Related Tasks

Task	Importance* to Overall Job Performance	Frequency** of Performance Under Specific Background Noise Conditions			
		Silence [a]	Moderate [b]	Loud [c]	Very Loud [d]
Speech Comprehension					
Radio transmission	5.6	5.1	7.0	6.5	4.0
Face-to-face conversations	5.2	4.9	6.5	5.5	3.1
Conversation when speaker is not visible (excluding telephone and radio use)	4.5	2.8	3.5	3.1	2.0
Telephone use	4.3	4.7	5.1	4.2	2.4
Sound Localization					
While on foot	5.4	4.1	5.6	5.1	3.4
While in patrol vehicle	5.4	4.1	5.9	5.3	3.6
Sound Detection					
While on foot	5.4	4.4	5.8	5.2	3.3
While in patrol vehicle	5.4	4.1	5.9	5.4	3.5
Sound Recognition					
Identify various types of alarms	4.4	3.3	4.4	3.9	2.3
Notice changes in sound of patrol car	4.1	3.7	5.0	4.1	2.6
Recognize beeps or clicks signaling message from device	4.1	3.8	4.8	4.3	3.0
Identify by sound an approaching vehicle	4.0	3.8	5.2	4.3	2.6

*IMPORTANCE SCALE					
Critically Important	Very Important	Important	Of Some Importance	Of Little Importance	Task Not Important
6	5	4	3	2	1

**FREQUENCY SCALE							
More than once per day	Daily	Several times a week	Weekly	Several times a month	Monthly	Less than once a month	I have never performed this task
8	7	6	5	4	3	2	1

a Silence: virtually no background noise
b Moderate: muffled street sounds, running car engine, quiet conversation, etc.
c Loud: honking horns, motorcycle engines, noisy restaurant, etc.
d Very loud: wailing sirens, large burning building, screaming mob, etc.

TABLE XII-2:
Summary of 1998 Subject Matter Expert Panel Ratings of Hearing Related Tasks

	SPEECH COMPREHENSION	SOUND LOCALIZATION	SOUND DETECTION & RECOGNITION
MOST COMMON TASKS	Radio transmissions and face-to-face conversations, most often amidst noise	Localizing sound while driving in alleys, on bike patrol, and wearing headgear	Recognizing sounds to investigate while on foot or in vehicle (e.g., alarms, approaching vehicles)
MOST IMPORTANT TASKS	Understanding dispatcher transmission against background noise; understanding communication from portable radios.	Localizing sound in patrol vehicle and on foot; determining direction of oncoming vehicles	All tasks were important as in 1984 (e.g., identifying alarms, someone running from behind, changes in patrol car sounds, identify approaching vehicles)
MOST COMMON CRITICAL INCIDENTS	Talking to driver beside freeway; radio communication while on patrol, communicating with suspect/ other officers.	Footsteps of suspects, vehicle sounds, rustling sounds, gunshot/projectile impact sounds.	Running sounds, breaking branches, etc. while chasing suspects; voices, slaps etc. during domestic violence calls.
COMMON BACKGROUND NOISES DURING CRITICAL INCIDENTS	Crowd noises; radio transmissions; vehicle traffic; helicopters and aircraft.	Vehicle traffic; radio transmissions; sirens.	Vehicle traffic; radio transmissions; neighborhood noises; helicopters and aircraft.

The ability to localize sound is critical to determining the direction of oncoming vehicles, locating and pursuing suspects, and a wide variety of other critical functions. The ability to detect and recognize a wide variety of sounds - including footsteps, vehicles, leaves, etc. - was also found to be an essential, everyday part of the job.

C. IMPLICATIONS FOR THE PRE-PLACEMENT SCREENING OF PEACE OFFICERS

Given the importance of these hearing functions, it would seem necessary to require candidates to have normal abilities. While this is a reasonable assumption, it is not necessarily the case that minor degrees of functional hearing impairment would impair job performance or create safety risks. This is an important and relevant issue to the extent that these functional abilities can be assessed clinically, and those with only minor impairment reliably identified. At the present time, this is possible only for speech comprehension in quiet and noise.

Regarding speech comprehension in noisy environments, the major consideration, which determines the significance of minor impairment, is the ratio of the speech level to the background noise level (S/N ratio). As background noise levels exceed about 50 dB, people will try to compensate by speaking louder and moving closer together to maintain comfortable listening (Pearsons, 1977). However, for every 1 dB increase in background noise, the average person raises his/her voice by only 0.6 dB. Therefore, as background noise increases, the S/N ratio decreases. At sufficient noise levels, even people with normal hearing abilities are as close as they can be, and are speaking

as loudly as they can, but still cannot understand every word that is spoken. If patrol duties are conducted at such levels of background noise that even officers with normal hearing have difficulty understanding speech, then even minor degrees of impairment due to hearing loss would make it increasingly difficult for an officer to effectively carry out his/her duties.

To address this issue, POST contracted with the House Ear Institute in Los Angeles (HEI) in 1999 to do field testing to determine background noise levels for patrol officer duties. Acoustical measurements were obtained at a variety of locations identified by subject matter experts as representative of the most important and acoustically challenging environments faced by officers. These included the interior of patrol vehicles during routine duties and on interstate freeways with radio communications and traffic noise; outside of vehicles during emergency response situations with ambulances and crowds present; and outside of vehicles alongside the freeway in response to a rush hour accident. As indicated in Table XII-3, routine urban patrol duties often include working in noise environments that are 70-80 dB(A). On freeways, or when sirens are on, noise levels can exceed 85 dB(A).

TABLE XII-3:
Distribution of Background Noise Levels for Patrol Duties

Noise level: / Patrol Duty	70-75 dB(A)	75-80dB(A)	80-85 dB(A)	>85dB(A)
	Percentage of sampling time			
Inside LAPD patrol vehicle on routine activities	35%	10%	0%	0%
Outside LAPD vehicle during emergency response situation with ambulance and crowds present	54%	28%	6%	6%
Inside CHP vehicle on interstate freeway with radio communications and traffic noise	11%	6%	16%	8%
Outside CHP vehicle along side of freeway during response to an accident at rush hour	0%	28%	59%	13%

Source: House Ear Institute data.

To determine the effect that such background noise has on the speech comprehension ability of persons with normal hearing, HEI tested more than 350 subjects with normal audiograms. Each subject was placed in a sound booth and asked to repeat recorded sentences while background noise was present. The sentences emanated from a speaker in front of the subject, while the noise came from either the same speaker or one located to the side of the subject. The former orientation is an acoustically more difficult listening situation.

This work indicated that even persons with normal hearing are likely to experience diminished speech comprehension in background noise at levels comparable to those that occur during patrol activities (Table XII-4). For example, LAPD patrol officers would be expected to experience up to 30% loss of speech comprehension as background noise levels approach 80 dB(A), and the noise source is in front or behind the officer.

This assessment assumed that the officer would get closer than 1 meter to the speaker as the noise increases. Of course, this may not be possible or desirable for patrol officers for various reasons. Given how challenging the acoustic environment is for persons with normal hearing, it appears reasonable to require that patrol officer candidates not have any additional impairment of this functional ability due to their intrinsic hearing loss.

TABLE XII-4:
Expected Speech Comprehension at Various Background Noise Levels and Directionality for Persons With Normal Hearing

Noise level:	70-75 dB	75-80 dB	80-85 dB	>85dB
Noise Orientation	Expected Speech Comprehension			
Noise in Front or Back	90%	70%	50%	<40%
Noise off to one side	100%	100%	100%	<100%

Source: House Ear Institute data based on sound-field HINT testing.
Assumes a maximum speech level of 85 dB based on work by Pearsons, 1977.

Regarding speech comprehension in quiet environments, the major consideration, which determines the significance of minor impairment, is the level of the speech likely to be encountered by patrol officers. The lower the level, the more difficult the task. Patrol officers may have to listen to conversations through windows or doors, or communicate to one another in whispered speech. Therefore, any acceptable impairment should not impede an officer's ability to perform these tasks.
Acoustic data regarding these tasks is limited. In a small study involving six males and four females, Nilsson (1992) found the average male whisper (measured at 1 meter) to be 40 dB(A) (s.d.=4.5) and the average female whisper to be 33 dB(A) (s.d.=4.7). The lowest whisper level was 27.4 dB(A). Two other sources report whispered speech to be 30 dB(A) (Borden 1984; Ostergaard, 1986). To ensure that a candidate could understand whispered speech from all male partners and most female partners, a reasonable guideline would require candidates to understand whispered speech at a volume of at least 30 dB(A) without difficulty. This guideline would also ensure the ability to understand male whispers at distances greater than 1 meter or through doors and windows.

Data collected by HEI indicates that candidates with some degree of impairment would still be able to pass this guideline. As part of a norming study for their speech comprehension test (the Hearing in Noise Test), the HEI found that persons with normal hearing could reliably repeat sentences presented at levels as low as 20 dB(A).

II. MEDICAL EXAMINATION AND EVALUATION GUIDELINES

A. GENERAL SCREENING RECOMMENDATIONS

1) History:

The Medical History Statement is adequate for general screening. However, note any history of severe head trauma (see definition in Neurology chapter), stroke, or attention deficit disorder.

2) Examination:

Ear examination is needed only if the screening audiogram is abnormal or there is a history of ear-related symptoms.

3) Routine Testing:

Pure tone threshold testing using appropriate psycho physical techniques should be conducted for each ear separately at 500, 1000, 2000, 3000, 4000, and 6000 Hz in an ANSI approved sound-treated booth (ANSI S3.1-1999) with equipment calibrated to ANSI standards (ANSI S3.6-1996). The test should be conducted by a certified audiologist, or CAOHC-certified "Hearing Conservationist." For acoustical reasons, audiograms must be done without hearing aids in place.

B. EVALUATION OF COMMON CLINICAL SYNDROMES

1) ABNORMAL AUDIOGRAM

a. GENERAL CONSIDERATIONS:

In general, an audiogram is considered to be abnormal if thresholds exceed 25 dB. In these cases, the examining physician must determine 1) whether the hearing loss is functionally relevant to the safe performance of patrol duties, and 2) whether the candidate needs to be evaluated by a hearing specialist to assess treatment options and/or prognosis.

High Frequency Loss:

The most common audiometric abnormality that the examining physician will encounter in candidates is the classic *"4000 Hz notch"* pattern. This audiogram is characterized by losses at 3000 and 4000 Hz and sometimes 6000 Hz, which greatly exceed those at 500, and 1000 Hz (Figure XII-1). The majority of these

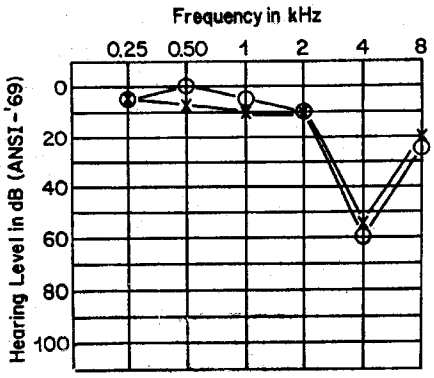

Figure XII-1. An example of a high-frequency notch audiometric configuration.

reflect sensorineural damage caused by noise exposure. In these cases, there are no treatment and the rate of progression depends primarily on whether the ears are protected from further damaging noise exposure.

The primary functional concern in these candidates is impaired speech comprehension in noise. However, it is difficult to predict impairment of this functional ability based on an audiogram alone. This is especially true with candidates whose hearing losses are usually in the mild to moderate range.

Therefore, many tests have been developed which require the subject to repeat lists of words or sentences presented in noise. However, these tests differ in a large number of testing characteristics which have a great impact an individual's performance on the test, including:

- use of words vs. sentences for speech material
- live voice vs. taped speech materials
- male voice vs. female
- use of headphones vs. sound field testing
- the spatial separation between the speech and the noise source
- the acoustics of the headphones or sound booth
- the type of background noise
- the S/N ratio
- the use of adaptive testing vs. fixed testing techniques

Consequently, speech comprehension scores from different tests are not directly comparable. Neither are scores from the same tests conducted at different locations, unless each location uses headphones/amplifiers calibrated with the same acoustical properties.

Additionally, most of the available tests have limited usefulness for pre-employment screening due to the lack of adequate control subjects. Establishing normative values is difficult, since all of the testing characteristics listed above must be the same for the controls and the subjects, and the control group must be of adequate size to have acceptable statistical properties.

At the present time, POST is aware of only one test, the Hearing in Noise Test (HINT) developed by HEI, which has acceptable minimum performance criteria for use in pre-employment screening. These major criteria include the following:

- *It is available in both headphone and sound field versions*. The headphone version is digitally engineered to create a virtual sound field listening environment so that information from both ears is available simultaneously. It offers the advantage of being commercially available; in addition, the results are not subject to testing error by inadvertent head movement by the candidate. However, it is imperative that a comparable free-field version of a test be available, since candidates who wear hearing aids cannot be tested using headphones. Presently, the free-field version is available in San Diego, Los Angeles, and San Francisco.

- *It has an adequate normal hearing control group*. Each of the three sites offering the free-field version has established its own normative values by testing 16-20 control subjects (no audiometric thresholds >25 dB). Normative values for the headphone version are based on a group of more than 50 subjects with normal hearing.

- *It is capable of spatial separation between the speech and the noise source.* In the sound field test, this is achieved by using two loudspeakers. In the headphone test, it is achieved by using computer-based virtual audio processing of the sounds for each headphone. This is important since functional impairment in many candidates may not be apparent unless there is a 90-degree spatial separation between the noise and the speech. This is also job relevant; for example, the ability to listen to patrol car radio communication while a window is down.

- *It uses adaptive testing techniques*. Non-adaptive tests consist of a fixed list of words or sentences of given difficulty. Consequently, many of the items will be well above or below the ability level of any given test taker, and therefore, will not contribute useful information on the hearing ability of that individual. In adaptive tests, the difficulty of items is adjusted to the ability of the test taker (based on their correct/incorrect response to previous items). Consequently, more information is obtained from each test item. Therefore, adaptive testing yields much more statistically powerful and reliable measurements compared to fixed tests of similar lengths, resulting in better differentiation between normal and abnormal hearers. In the HINT test, the presentation level of the test sentences is varied using an adaptive technique in a constant noise background until the subject repeatedly responds correctly to 50% of the test sentences. The result is then expressed as a S/N ratio.

- *It uses a stationary background noise with the same average level across frequencies as the speech.* The type of background noise used to measure speech understanding in noise will affect both the accuracy and the reliability of the measurement. Noise with a wide range of level variations over time, such as recordings of crowd noise, can produce unreliable measures of speech understanding unless very lengthy tests are used. Noise with small level variations over time, i.e., stationary noise, and with equal levels at all frequencies (white noise) can produce reliable measures of speech understanding that cannot be accurately generalized to job-related noise environments. The most appropriate background noise is a stationary noise with the same average levels at all frequencies as speech. This type of noise allows reliable, accurate, and conservative prediction of speech understanding in job-related noise environments.

Bilateral Low Frequency Loss:

Candidates with low frequency hearing loss commonly have audiograms that have a "flat" configuration (Figure XII-2), since the audiometric losses extend from the low frequencies through the high frequencies, and all of the losses are of the same approximate magnitude (±15 dB).

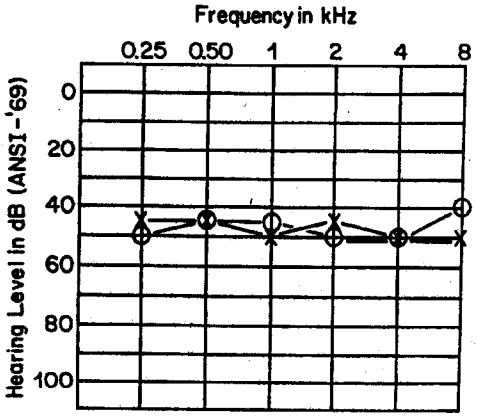

Figure XII-2. An example of a relatively flat audiometric configuration.

This loss can be either sensorineural or conductive in origin. This is an important distinction since conductive losses may be reversible. Common causes of conductive hearing loss among candidates include a wax build-up, serous otitis from allergies, and perforated tympanic membrane. An uncommon cause is otosclerosis. Sensorineural causes include Meniere's Syndrome and genetic disorders.

The primary functional significance of bilateral low frequency losses is impaired speech comprehension and sound detection in quiet. While speech comprehension in quiet is correlated with low frequency audiometric thresholds, there is a wide range of commercially available tests available for testing of speech comprehension in quiet. As

with speech in noise testing, these tests vary on a number of performance characteristics that can have an impact on the test results. However, an acceptable test of quiet functioning is routinely included as part of the HINT procedure discussed above.

There are no standard tests for sound detection in quiet, except the audiogram itself. The audiogram gives hearing thresholds or "detection abilities" at specific frequencies.

Asymmetric Hearing Loss:

In general, hearing loss is considered to have an asymmetric pattern if there is a difference between the left and right ears in average audiometric thresholds of 20 dB or more in the lower frequencies or 35 dB or more in the higher frequencies. This condition often has the same causes as low frequency hearing loss, as discussed above. However, in rare cases, this may be caused by an acoustic neuroma, a benign but progressively destructive lesion.

Persons with asymmetric hearing loss may have difficulty both understanding speech in noise and localizing environmental sounds. The impact on speech comprehension is most evident when there is a noise source on the subject's good side, and the hearing loss includes the higher frequencies. Impairment of the ability to localize environmental sounds is more likely to occur if the hearing loss involves all or most of the audiometric thresholds on one side. At the present time, it is not possible to accurately predict localization ability based on the audiogram alone, and there are no commercially available functional tests.

b. RECOMMENDED EVALUATION PROTOCOL:

Before assigning a candidate to one of the groups below, it is important to determine if the hearing loss is reversible. Recent colds, or bouts with allergies frequently cause a temporary conductive hearing losses, and warrant repeat audiometric testing after these conditions have resolved. The American Academy of Otolaryngology recommends a medical specialist evaluation based on any of the following:

1) Average hearing level at 500, 1000, 2000, and 3000 Hz greater than 25 dB, in either ear.

2) Difference in average hearing level between the better and poorer ears of

   a) More than 15 dB at 500, 1000, and 2000 Hz, or

   b) More than 30 dB at 3000, 4000, and 6000 Hz.

3) History of ear pain; drainage; dizziness; severe persistent tinnitus; sudden, fluctuating, or rapidly progressive hearing loss; or a feeling of fullness or discomfort in one or both ears within the preceding 12 months.

4) Cerumen accumulation sufficient to completely obstruct the view of the tympanic membrane or a foreign body in the ear canal.

When requesting an otologic evaluation, it is helpful to specify that the otologist should address only the issues of reversibility and prognosis, not fitness for duty as a patrol officer. The latter should be a separate assessment following the guidelines below.

Group I: Normal audiogram (all thresholds between 500-6000 Hz are 25 dB or better in both ears)

These candidates are unlikely to have functional impairment unless they have a retrocochlear condition discussed below in section (3).

Group II: One or more thresholds are >25 dB in either ear

A functional hearing evaluation is recommended. This evaluation should consist of directional speech comprehension in noise and speech comprehension in quiet using the HINT test or other tests that meet the performance characteristics stated earlier in this guideline. Candidates who perform more poorly than the 5th percentile of the normal hearing control group under any of the three background noise conditions (noise in front, right, or left) should be restricted from safety-sensitive tasks which require accurate and rapid understanding of speech in noise. Candidates with quiet thresholds greater than 28 dB(A) on the HINT should be restricted from safety-sensitive tasks, which require accurate and rapid understanding of whispered speech and speech heard through doors or windows. [Note: A quiet threshold on the HINT test of 28 dB(A) corresponds to an intelligibility of approximately 90% at the job-critical level for soft or whispered speech of 30 dB(A).]

Consideration of Prior Experience:

It could be argued that prior peace officer experience may mitigate some of the impact of functional impairment on a candidate's job performance. For example, familiarity with typical police communications may reduce the criticality of understanding *every* word of communication. Furthermore, the judgment gained from prior experience may somewhat compensate for the loss of speech information in a given situation. However, great caution must be exercised when considering prior experience. The degree and nature of prior law enforcement experience can vary dramatically, thereby limiting the ability to confidently generalize across this candidate group. It is possible that experience accrued elsewhere (e.g., a different state with different penal codes) could result in a negative transfer of training - i.e., these officers might need to *unlearn* some of the agency-specific jargon of their previous employers. For these reasons, it is recommended that prior experience only be considered in very close-call (i.e., borderline) cases.

2) USE OF HEARING AIDS

a. GENERAL CONSIDERATIONS:

There are two major considerations with hearing aids:

1. *Do they restore normal functional ability?*

   Hearing aids are battery-powered electronic circuits with a miniature microphone and loudspeaker that are designed to fit in the ear canal. The circuits amplify sound from the microphone by different amounts at different frequencies to compensate for loss of sensitivity. In theory, they should restore hearing function to normal.

   Unfortunately, the hearing aids that are currently available do not meet this goal completely. In fact, the U.S. F.D.A. requires manufacturers to warn consumers that these devices do not restore normal hearing. While hearing aids can substantially improve such tasks as sound detection and comprehension in quiet environments, they provide limited benefit for hearing critical tasks that are performed in noise. This is especially true for patients with predominantly high frequency losses. Improvement of sound localization ability is also difficult to achieve.

2. *If they can restore normal functional ability, can they be depended upon to reliably function as a mitigating device during full field activities?*

   To be considered a mitigating device, hearing aids would have to be worn at all times when an officer is assigned to field duties, and the aids would have to be effective when worn.

   Unfortunately, people who obtain hearing aids often choose to not wear them. Ovegard (1994) found that 34% of patients wore them less than one hour a day when asked one year after the aids were dispensed. Sorri (1984) found that 43% of patients did not wear them every day when asked two years after the aids were dispensed. Of perhaps the most relevance to the law enforcement candidate population, Surr (1978) found that 34/97 patients who were 21-40 years old wore their aids only "occasionally" (1%-50% of the time). The primary reasons for non-use were background noise and a perceived lack of need. These studies indicate that an employing law enforcement agency would need to use pre-placement agreements and have an active monitoring program to ensure compliance. This may or may not be practical depending on agency specific factors.

   However, unlike analogous monitoring programs for contact lenses, confirmation by a supervisor that an officer is wearing a hearing aid does not automatically mean that the device is providing its expected benefit under field conditions due to the following:

Acoustic feedback - Feedback produces an audible and distracting squealing sound from the hearing aid, and a distorted sound output. This occurs when sound from the hearing aid loudspeaker leaks back through the ear canal to the microphone. Feedback occurs when the hearing aid is improperly seated in the ear canal, during exaggerated jaw movements, or when a hand or other sound-reflecting object is held near the ear.

Batteries - Hearing aid batteries usually have a life of several weeks, depending on how much the hearing aid is used and whether it is turned off at night. Weak batteries or a difference in battery strength between the right and left aid could reduce the effectiveness of the aids.

Control switches and knobs - Many hearing aids have an on-off switch, volume control, and perhaps adjustable controls. Hearing aids may need to be adjusted as the sound environment changes. If the controls were misadjusted, less than optimal performance would occur.

Earwax and debris in the ear canal - The opening in the hearing aid for the loudspeaker output is relatively deep in the ear canal where earwax and tissue debris can accumulate and block the opening. This type of blockage is a common occurrence, and usually requires a visit to an audiologist to have the blockage removed without damage to the hearing aid.

Loss of the hearing aid during a critical incident - Hearing aids are held in place by the snugness of the device in the ear canal. Vigorous physical activity or a blow to the head could easily cause a hearing aid to be dislodged or shattered.

In conclusion, there are a number of very real concerns, both functional and practical, surrounding the use of hearing aids by patrol officers. However, fair employment laws require that an agency evaluate each aided candidate on a case-by-case basis. The Recommended Evaluation below provides a protocol for assessing functional hearing ability. If it is determined that a candidate possesses adequate functional ability, an agency should then consult with an otological specialist to review the practical concerns discussed above, as well as to evaluate the candidate's specific experience with hearing aids and any agency-specific factors which may be relevant before a final decision is made regarding whether the candidate's use of hearing aids is "acceptable."

b. RECOMMENDED EVALUATION PROTOCOL:

Aided candidates who wish to be tested with their hearing aids should be administered the HINT to assess speech comprehension ability in noise and quiet. Both tests must be administered by sound field methods rather than headphones. At the present time,

sound field HINT testing is available at San Francisco[2], Los Angeles[3], and San Diego[4]. An aided audiogram can be reviewed to evaluate sound detection ability.

Prior to functional testing, the examining physician should ensure that the aids have been worn regularly for at least one month, since it takes some practice before a patient obtains the maximum benefit from the hearing aids. Furthermore, the examining physician should obtain all records from the audiologist who dispensed the hearing aids. These must include documentation of the fitting program and other hearing aid settings, which are used on a regular basis by the subject. This information needs to be reviewed by the certified audiologist performing the HINT procedure to verify that the settings have not been intentionally altered.

It is critically important that the audiologist use the following protocol, and that no modifications to the candidate's hearing aid program or settings should be made prior to or during the performance of this protocol.

1) Evaluate whether the aids are working properly: The electroacoustic response characteristics of each hearing aid worn by the candidate should be measured in an appropriate acoustic coupler and test chamber according to ANSI specifications (ANSI 1992 and 1996). It is especially important that the response of the hearing aid(s) be measured at the four designated input levels with a broadband test signal, as specified in the standards. All measurements should be printed and retained in the subject's records. If the hearing aids are not in proper working condition, no further testing should be performed at the time. The subject may elect to have the hearing aids repaired or replaced and return to repeat the protocol. In this event, the entire protocol, including measurements of the electroacoustic response characteristics of each hearing aid, should be repeated with the new or repaired hearing aids. Hearing aid sales, repairs, and replacements should be from an independent provider other than the provider of the functional assessment services.

2) *Review the candidate's regular fitting program and settings:* These should be equivalent to those measured above. If not, no further testing should be performed at the time.

3) *Determine whether the functional gain is both physiologic and appropriate for the subject's hearing loss:* Unaided and aided binaural sound field thresholds should be measured at 250, 500, 1000, 2000, 3000, 4000, and 6000 Hz, using warble tone stimuli presented from a loudspeaker positioned 1 meter in front of the subject at 0 degrees azimuth. If the functional gain is not physiologic and appropriate, then no further testing should be performed at the time.

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[2] University of California, San Francisco Audiology Clinic (415) 353-2101

[3] House Ear Institute Audiology Clinic, Los Angeles (213) 483-9930

[4] San Diego State University Audiology Clinic (619) 594-7747

4) *Perform aided sound field HINT in noise and quiet:* Compare the results to the site-specific normal values for sound-field Noise Front, Noise Right, and Noise Left conditions. If the measured thresholds are better than the 5th percentile under all three conditions, then repeat the noise testing with the background noise fixed at 80 dB(A). The same normative values used with the standard background noise levels may be used to assign percentile scores to these results (Soli, 2001).

5) *Send all results to the examining physician.*

Upon receipt of the results from the audiologist, the examining physician may use the evaluation algorithm described in Section 1 (Abnormal Audiogram) with one exception. Since many present day hearing aids employ methods of sound processing that vary as a function of the background noise level, it is necessary to measure aided sound-field HINT thresholds through a range of background noise levels. Therefore, candidates who use hearing aids should be functionally normal both under standard HINT background noise levels (i.e., 65 dB) and at levels that are commonly encountered in the field (80 dB).

If the candidate has demonstrated acceptable functional ability when wearing hearing aids, the examining physician should inform the hiring department that the candidate must wear hearing aids when assigned to field duty or other hearing critical tasks. The subsequent determination as to whether hearing aids are acceptable should be determined by the hiring department, in consultation with otological specialists, as discussed above.

3) RETROCOCHLEAR CONDITIONS

Understanding speech is not just an auditory process, but also involves cerebral processing of the signals from the ear. Therefore, for a variety of reasons, functional impairment may occur when the audiogram is normal. Known as obscure auditory dysfunction or discriminatory hearing loss, this condition may represent up to 10% of the patients that visit hearing specialists. Known causes include cortical damage due to stroke or head trauma, and attention deficit disorder (Cook, et al., 1993). While not pathological, learning English as a second language also affects the ability to understand English in noise. This is especially true when English is learned after age 14 (Mayo, et al., 1997).

For these reasons, candidates with the following should be required to have functional hearing testing even when their audiograms are normal:

a) History of moderate-to-severe head trauma (see Neurological section for definition)

b) History of a stroke

c) History of attention deficit disorder

d) Learned English as a teenager or older.

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APPENDIX A

MEDICATION-RELATED IMPAIRMENT[1]

I. INTRODUCTION

Medication-induced impairment can place a patrol officer and others at substantial risk of harm. Consequently, all candidates who report the use of medications on either a chronic or intermittent basis must be carefully evaluated.

Much has been written regarding the potential for various medications to adversely affect work performance (see series of articles in JOM 32(4):310-369,1990). Fortunately, many classes of these medications such as the phenothiazines, benzodiazepines, and the tricyclics are rarely used by patrol officer candidates. More commonly, a candidate will report seasonal use of over-the-counter antihistamines to control allergies, or intermittent use of mixtures containing barbiturates (such as Fiorinal) for headaches.

In this section, two examples -- OTC antihistamines and butalbital -- will be used to illustrate a generic approach to the evaluation of candidates who use medication.

II. GENERAL CONSIDERATIONS

The consideration of a candidate who uses medication can follow a stepwise approach:

1) **What are the potential side-effects which are relevant to patrol officer duties?**

   There are numerous sources of information that can be used to answer this question. The best textbooks include The Pharmacological Basis of Therapeutics by Goodman & Gilman, and the AHFS Drug Information (yearly update) by the American Society of Hospital Pharmacists, Inc.

   OTC Antihistamines: The primary side-effect is sedation. Dizziness, lassitude, diminished coordination, vertigo, blurred vision, and muscular weakness may also occur.

   Butalbital: Adverse side-effects include drowsiness, lethargy, vertigo, CNS depression, and mental depression.

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[1]Author: R. Leonard Goldberg, M.D.
Reviewer: Marceline Burns, Ph.D.

2) **Does the candidate in question experience these side-effects to a significant degree?**

There are several ways to address this question:

a. Ask the candidate directly. This approach has the highest specificity, but the lowest sensitivity. The latter can be limited not only by the candidate's honesty, but also by a genuine lack of self-awareness that the individual may experience significant impairment. This phenomenon is commonly observed in drug impairment research (Vollmer, et al., 1983).

OTC Antihistamines: Ridel, et al. (1987) found that subjects were unaware of their own impairment (equivalent to a blood alcohol concentration of 0.05%) while driving an instrumented automobile. Seidel, et al. (1987) found that sedation and slower reaction times caused by hydroxyzine may occur without the subjects' awareness.

Butalbital: Users may be entirely unaware of impairment associated with the residual or "hangover" effect.

b. Assume that most candidates will be impaired. This approach has the highest sensitivity, but the lowest specificity. Whether a particular candidate will experience impairment depends on numerous factors, such the nature of the drug, the dose, drug interactions, metabolism and excretion by the individual, and whether the medication is taken chronically vs. intermittently. These considerations make it difficult, legally, to categorically restrict candidates. However, this approach could probably be used to justify a temporary deferral until the candidate obtains a non-impairing therapeutic alternative (see #3).

OTC Antihistamines: Across studies, 10-20% of individuals have been found to experience sedation (Mygind & Weeke, 1983). Frequently, the side effect is dose-related (Simons & Simons, 1988). Tolerance develops with steady dosing; however, if the interval between/doses is sufficient for blood levels to drop, sensitivity will reappear with the next dose.

Butalbital: Rather than a side-effect, CNS depression is an intended main effect, presumably affecting the majority of persons taking the medication. Tolerance to chronic dosing is expected.

c. Have the candidate undergo functional testing while under the influence of the medication. For example, neurobehavioral testing can assess the impact of a particular drug in a particular candidate, while various pen & paper and computerized test batteries can assess attention, visual-spatial and visual-motor abilities, and memory. These tests are performed routinely in specialized neuropsychological testing laboratories at most major university medical centers. The candidate's results can be compared to age-adjusted norms.

Although this approach is attractive, the cost of testing can be quite high (>$1000). In addition, test sensitivity may be limited by numerous factors. For example, test batteries may not be properly selected to detect the specific effects of a particular drug (e.g., a laboratory's emphasis may be on the assessment of permanent neurological or organic deficits, as opposed to changes that result from acute and/or chronic dosing with drugs). In addition, at various times a given drug dose may produce different blood levels and different behavioral effects in the same individual. Therefore, the inability to demonstrate neuropsychological effects on a given day does not guarantee that effects will not occur at other times.

OTC Antihistamines: Examining for the effects of antihistamines, which impair primarily by sedating, requires tests which will permit mild-to-moderate drowsiness. The drug's effects cannot be measured with very demanding or stimulating tests which offset the drowsiness.

Butalbital: Examining for the effects of a CNS depressant, such as butalbital, requires complex tasks which overload the central processing capacity and permit measurement of slowing.

3) **Is there an effective alternative drug which would not impair performance?**

Recommending that candidates see their treating physician to obtain an alternative drug with fewer side-effects is often the most reliable and least expensive method of reducing medication-related impairment. Fortunately, there are non-impairing alternatives for a variety of medications (e.g., Buspar instead of Valium, Prozac instead of Elavil).

OTC Antihistamines: The second generation H1-blockers, such as terfenadine and astemizole, have not been associated with neurobehavioral impairment. However, these are not available on an OTC basis.

Butalbital: Alternative analgesics, such as NSAIDS, can be used.

Assurance that the candidate will continue to use the alternative drug after hire can be a concern. However, this could be addressed by means of a pre-placement contract with the candidate. Alternatively, for hiring agencies with a random drug testing program in place, a recommendation could be made to include certain therapeutic drugs in the screening panel.

Following this stepwise approach should provide the evaluating physician with enough information to make a determination as to whether a given candidate warrants a restriction or deferral due to potential medication-related impairment.

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APPENDIX B
PARTICIPATING MEDICAL SPECIALISTS[1]

CARDIOVASCULAR

Panel Meeting/Activities:
Fall, 1991

Author:
Stephen G. Weyers, M.D.

Specialist Review Panel:
Lee Cady, M.D.
County of Los Angeles

Robert Holly, Ph.D.
U.C. Davis Medical Center

Tissa Kappagoda, M.D.
U.C. Davis Medical Center

John Rutledge, M.D.
U.C. Davis Medical Center

Jeffrey Tanji, M.D.
U.C. Davis Medical Center

DERMATOLOGY*

Panel Meeting/Activities:
Fall, 1992

Author:
Stephen G. Weyers, M.D.

Specialist Review Panel:
Tim Berger, M.D.
San Francisco General Hospital

Robert Adams, M.D.
Stanford University

Nikolajs Lapins, M.D.
Private Practice, San Fransisco

Gerald Gellin, M.D.
Private Practice, San Francisco

ENDOCRINOLOGY

Panel Meeting/Activities:
Winter, 1991; Fall, 1995

Author:
Stephen G. Weyers, M.D.

Specialist Review Panel:
Kenneth Feingold, M.D.
VA Medical Center
San Francisco

Lois Jovanovic-Peterson, M.D.
Sansum Medical Research Foundation
Santa Barbara

Sherman Holvey, M.D.
Private Practice, Los Angeles

GASTROINTESTINAL

Panel Meeting/Activities:
2000-2001

Author:
R. Leonard Goldberg, M.D.

Specialist Review Panel:
Craig Johanson, M.D.
Private Practice, San Fransisco

Ralph Koldinger, M.D.
Sacramento Gastoenterology

Michael Lawson, M.D.
Kaiser Permanente
Sacramento

HEMATOLOGY/ONCOLOGY

Panel Meeting/Activities:
2000-2001

Author:
R. Leonard Goldberg, M.D.

Specialist Review Panel:
Solomon I. Hamburg, M.D.
Tower Hematology/Oncology
Medical Group, Los Angeles

Howard Liebman, M.D.
University of Southern California

Eileen Weitz, M.D.
UCLA
Los Angeles

Jerry Powell, M.D.
U.C. Davis Medical Center

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[1] Both oversight physicians -- Drs. R. Leonard Goldberg and Stephen Weyers -- participated in all meetings, as did the project manager, Shelley Spilberg, Ph.D.

*Review of this chapter was performed independently.

INFECTIOUS DISEASE

Panel Meeting/Activities:
Summer, 1992

Author:
R. Leonard Goldberg, M.D.

Specialist Review Panel:
Ronelle Campbell, D.O.
Department of Corrections

Julie Gerberding, M.D.
San Francisco General Hospital

Karen Lindsay, M.D.
USC Ambulatory Health Center

MUSCULOSKELETAL - KNEE

Panel Meeting/Activities:
Winter, 1992

Author:
R. Leonard Goldberg, M.D.

Specialist Review Panel:
Dale Daniel, M.D.
Kaiser Permanente
San Diego

James Garrick, M.D.
Center for Sports Medicine
St. Francis Memorial Hospital
San Francisco

James Stark, M.D.
Center for Sports Medicine
St. Francis Mem. Hosp., S.F.

MUSCULOSKELETAL - BACK

Panel Meeting/Activities:
Winter, 1992

Author:
R. Leonard Goldberg, M.D.

Specialist Review Panel:
Stanley Bigos, M.D.
University of Washington Medical Center
Seattle, WA

James Stark, M.D.
Center for Sports Medicine
St. Francis Memorial Hospital
San Francisco

Vert Mooney, M.D.
UCSD Medical Center
San Diego

MUSCULOSKELETAL - UPPER/LOWER EXTREMITIES

Panel Meeting/Activities:
Winter, 1992

Author:
R. Leonard Goldberg, M.D.

Specialist Review Panel:
David Levine, M.D.
La Cienega Medical Industrial
Los Angeles

Phillip Sobol, M.D.
Neurological Orthopedic Assoc.
Los Angeles

NEUROLOGY

Panel Meeting/Activities:
2000-2001

Author:
R. Leonard Goldberg, M.D.

Specialist Review Panel:
Steven Holtz, M.D.
Neurology Medical Group
Walnut Creek

Lee Kudrow, M.D.
California Medical Clinic for Headache
Encino

Richard Riemer, M.D.
Private Practice, Sacramento

Nazhiyath Vijayan, M.D.
U.C. Davis Medical Center
Sacramento

RESPIRATORY

Panel Meeting/Activities:
Summer, 1991

Author:
R. Leonard Goldberg, M.D.

Specialist Review Panel:
James R. Dexter, M.D.
Beaver Clinic, Redlands

Philip Harber, M.D.
University of CA, L.A.

William G. Hughson, M.D.
University of CA, San Diego

VISION GUIDELINES

Panel Meeting/Activities:
Summer, 1993

Author:
R. Leonard Goldberg, M.D.

Specialist Review Panel:
Chris Johnson, Ph.D.
Deptartment of Ophthalomogy
UC Davis

James Bailey, O.D.
Southern California College of Optometry
Fullerton

James Sheedy, O.D.
Private Practice, Walnut Creek

Ian Bailey, O.D.
School of Optometry
University of California/Berkeley

Michael Gordon, M.D.
Private Practice, San Diego

HEARING GUIDELINES

Panel Meeting/Activities:
2000-2001

Author:
R. Leonard Goldberg, M.D.

Specialist Review Panel:
Donald Dirks, Ph.D.
Private Practice, Los Angeles

Marc Kramer, Ph.D.
Private Practice, New York

Don Morgan, Ph.D.
Decibel Instruments, Inc.
Fremont

Sigfrid Soli, Ph.D.
House Ear Institute
Los Angeles

J. C. Spottswood, J.D., M.P.H.
US Office of Personnel Management
Washington, DC

Robert Sweetow, Ph.D.
Audiology
San Francisco

Colonel Nancy L. Vause
United States Army - Fort Sam
Houston, TX

Steve Weyers, M.D.
State Personnel Board
Sacramento

State of California
MEDICAL HISTORY STATEMENT
POST 2-252 (12/01) – Page 1

Department of Justice
Commission on Peace Officer Standards and Training
1601 Alhambra Boulevard
Sacramento, CA 95816-7083

Pursuant to the Federal Privacy Act (Public Law 93-579 and the Information Practices Act (IPA) of 1977 (Civil Code Sections 1798, *et seq*.), notice is hereby given for the request of personal information. Failure to provide all or any part of the requested information may delay processing of this form, or result in an incomplete record. No disclosure of personal information will be made unless permissible under Article 6, Section 1798.24 of the IPA of 1977. Each individual for whom personal information is collected has the right to inspect that information in any record maintained by POST. Inquiries may be directed to the POST Information Practices Act Coordinator at the address listed above. Contact the POST Information Services Bureau for instructions on requesting records.

INSTRUCTIONS

- POST Regulation 1002(a)(7) requires that peace officer candidates be examined by a licensed physician and surgeon to ensure the absence of any physical defect or medical condition which might adversely affect job performance.
- The information you provide in this statement is extremely important. It will be used by a medical health professional to evaluate your qualifications for the position of entry-level law enforcement officer, which in most agencies consists of the patrol officer function. Therefore, please fill out the questionnaire completely and accurately. Please keep in mind that: (a) all statements are subject to verification; (b) deliberate inaccuracies or incomplete statements may bar or remove you from employment.
- This form must be completed and presented when reporting for your medical examination. This information will assist the examining physician in conducting your medical examination and in making appropriate recommendations.
- When answering questions, place an "X" in the appropriate box. Please explain all "Yes" items in the designated areas. Most individuals will have some "Yes" answers. A "Yes" answer does not necessarily mean that you will be disqualified.
- This statement is confidential. If hired, the information you provide will be part of your medical record, separate from your personnel file.
- Type or legibly print (in ink) required information on printed form. To access this form on the POST website, go to www.post.ca.gov.

SECTION 1: CANDIDATE IDENTIFICATION

CANDIDATE'S NAME (Last, First, Middle)		BIRTHDATE (MM/DD/YYYY)	
ADDRESS WHERE YOU CAN BE CONTACTED (Street / P.O. Box)	CITY	STATE	ZIP
PHONE NUMBERS WHERE YOU CAN BE REACHED DAY ( ) - EXT	EVENING ( ) - EXT	E-MAIL	
SOCIAL SECURITY NUMBER - -	(In accordance with the Federal Privacy Act of 1974, disclosure is voluntary. The Social Security Number will be used for identification purposes to ensure that proper records are maintained.)		

SECTION 2: CONSENT

I, the undersigned, do hereby consent to undergo a medical examination, including blood and urine testing, x-rays, skin tests, and other examinations which the examiner may consider necessary to complete the medical evaluation. I also authorize the medical examiner to obtain current or past medical records and to discuss my medical status and history with my treating physician or other medical consultants as necessary.

SIGNATURE IN FULL	DATE

SECTION 3: JOB HISTORY

Please list previous jobs that lasted at least six (6) months, including military service.

JOB TITLE	EMPLOYER / LOCATION (CITY, STATE, OR COUNTRY IF OVERSEAS)	EMPLOYMENT DATES (MM/DD/YYYY)
		–
		–
		–
		–
		–
		–

MEDICAL HISTORY STATEMENT

SECTION 4: MEDICAL HISTORY – Indicate if you have ever had any of the following conditions.

	Y	N	?	EYE, EAR, NOSE, THROAT
1	☐	☐	☐	Eye surgery
2	☐	☐	☐	Need to wear glasses / contact lenses
3	☐	☐	☐	Cataracts
4	☐	☐	☐	Blurred or double vision
5	☐	☐	☐	Color deficiency or blindness to any degree
6	☐	☐	☐	Orthokeratology
7	☐	☐	☐	Radial keratology (refractive surgery) or keratotomy
8	☐	☐	☐	Glaucoma
9	☐	☐	☐	Sinus trouble
10	☐	☐	☐	Hoarseness (frequent or recent)
11	☐	☐	☐	Allergy / hay fever
12	☐	☐	☐	Ruptured ear drum
13	☐	☐	☐	Ringing or buzzing in ears
14	☐	☐	☐	Loss of hearing
15	☐	☐	☐	Ear surgery
16	☐	☐	☐	Earaches
	Y	N	?	RESPIRATORY
17	☐	☐	☐	Asthma (list age of last episode: _____)
18	☐	☐	☐	Shortness of breath
19	☐	☐	☐	Chronic or frequent cough
20	☐	☐	☐	Tuberculosis
21	☐	☐	☐	Emphysema
22	☐	☐	☐	Coughed up blood
23	☐	☐	☐	Pneumothorax (collapsed lung)
24	☐	☐	☐	Pneumonia
25	☐	☐	☐	Sarciodosis
26	☐	☐	☐	Chest tightness
27	☐	☐	☐	Wheezing
28	☐	☐	☐	Blood clot in lungs
	Y	N	?	GASTROINTESTINAL
29	☐	☐	☐	Ulcer / stomach trouble
30	☐	☐	☐	Vomited blood
31	☐	☐	☐	Persistent diarrhea
32	☐	☐	☐	Colitis
33	☐	☐	☐	Recurrent hemorrhoids
34	☐	☐	☐	Gall bladder trouble
35	☐	☐	☐	Hepatitis / jaundice
36	☐	☐	☐	Recurrent stomach pain
37	☐	☐	☐	Mucous in stool
38	☐	☐	☐	Pancreatitis
39	☐	☐	☐	Abnormal liver tests
40	☐	☐	☐	Hernia
41	☐	☐	☐	Ulcerative colitis
42	☐	☐	☐	Irritable Bowel Syndrome
43	☐	☐	☐	Ulcer
44	☐	☐	☐	Chron's disease
	Y	N	?	GENITOURINARY
45	☐	☐	☐	Kidney disease or stone
46	☐	☐	☐	Bladder trouble
47	☐	☐	☐	Difficulty in urinating
48	☐	☐	☐	Blood in urine
49	☐	☐	☐	Prostate trouble
50	☐	☐	☐	Irregular vaginal bleeding
51	☐	☐	☐	Menstrual problem that kept you from work
52	☐	☐	☐	Currently pregnant
	Y	N	?	CARDIOVASCULAR
53	☐	☐	☐	Heart attack or chest pain
54	☐	☐	☐	Heart trouble / murmur
55	☐	☐	☐	Mitral valve prolapse
56	☐	☐	☐	Palpitation (irregular heartbeat)
57	☐	☐	☐	High blood pressure
58	☐	☐	☐	Pain or discomfort in chest
59	☐	☐	☐	Rheumatic fever
60	☐	☐	☐	Swelling of feet
61	☐	☐	☐	Leg pain on walking
62	☐	☐	☐	Painful varicose veins
	Y	N	?	MUSCULO SKELETAL
63	☐	☐	☐	Fractures / broken bones
64	☐	☐	☐	Back trouble / pain or sciatica
65	☐	☐	☐	Neck trouble / pain
66	☐	☐	☐	Numbness of extremities
67	☐	☐	☐	Shin pains
68	☐	☐	☐	Arthroscopy
69	☐	☐	☐	Arthritis / rheumatism
	Y	N	?	JOINT INJURY / SURGERY / DISLOCATION / PAIN / SWELLING
70	☐	☐	☐	Shoulder
71	☐	☐	☐	Elbow
72	☐	☐	☐	Wrist
73	☐	☐	☐	Finters / toes
74	☐	☐	☐	Hip
75	☐	☐	☐	Knee
76	☐	☐	☐	Ankle/ foot
	Y	N	?	NEURO-PSYCHIATRIC
77	☐	☐	☐	Epilepsy
78	☐	☐	☐	Convulsions / seizures
79	☐	☐	☐	Fainting spells / blackouts
80	☐	☐	☐	Recurrent dizziness
81	☐	☐	☐	Head injury
82	☐	☐	☐	Frequent / recurrent headaches
83	☐	☐	☐	Stroke
84	☐	☐	☐	Skull defect
85	☐	☐	☐	Meningitis / encephalitis
86	☐	☐	☐	Need psychological care
87	☐	☐	☐	Mental hospitalization
88	☐	☐	☐	Attention deficit disorder
89	☐	☐	☐	Dyslexia
	Y	N	?	MISCELLANEOUS
90	☐	☐	☐	Diabetes (glucose in urine)
91	☐	☐	☐	Low blood sugar
92	☐	☐	☐	Thyroid trouble
93	☐	☐	☐	Bleeding tendencies
94	☐	☐	☐	Anemia
95	☐	☐	☐	Enlarged glands
96	☐	☐	☐	Cyst / tumor
97	☐	☐	☐	Skin problems / rashes
98	☐	☐	☐	Wool allergy
99	☐	☐	☐	Non-healing sores
100	☐	☐	☐	Recent change in a wart or mole
101	☐	☐	☐	Cancer / leukemia
102	☐	☐	☐	Chronic fatigue
103	☐	☐	☐	Night sweats
104	☐	☐	☐	Undesired weight loss or gain
105	☐	☐	☐	Heat stress
106	☐	☐	☐	Environment illness
107	☐	☐	☐	Multiple chemical sensitivity
108	☐	☐	☐	Fever lasting 1 month or more
109	☐	☐	☐	Eczema
110	☐	☐	☐	Gulf War Syndrome
111	☐	☐	☐	Any other problem or illness not listed that may affect job performance

SECTION 5: MEDICAL CONDITION EXPLANATION(S)

Provide explanations for any medical condition(s) marked "yes" in Section 4. Reference the corresponding item number in your response.

ITEM #	EXPLANATION	ITEM #	EXPLANATION

SECTION 6: OTHER MEDICAL

Please answer each of the following questions:

Y N ?

☐ ☐ ☐ 112. Have you ever had a medical exam for employment as a peace officer?
If yes, a) What year? b) For what agency / municipality:

☐ ☐ ☐ 113. Have you worked as a peace officer before? If yes, where:

☐ ☐ ☐ 114. Describe your typical exercise or physical activity including that at work; indicate how often and how long you've been doing it.

	EXERCISE / ACTIVITY	HRS/WEEK	HOW LONG?
a)			yrs mos
b)			yrs mos
c)			yrs mos

☐ ☐ ☐ 115. Have you ever coughed, wheezed, or had chest discomfort after exercise?

☐ ☐ ☐ 116. Do you ever become short of breath when walking with other people of your own age at level ground?

☐ ☐ ☐ 117. Do you currently smoke cigarettes? If yes, a) How many packs per day? b) For how long (in years)?

☐ ☐ ☐ 118. Are you an ex-smoker? If yes, a) How many years did you smoke? b) How many packs per day? c) What year did you quit?

☐ ☐ ☐ 119. Are you now or have you ever been enrolled in a drug or alcohol rehabilitation program? If yes, please give description and dates.

	PROGRAM	FROM – TO (MM/DD/YYYY)
a)		–
b)		–

120. When was your last alcoholic drink? _____ a) ☐ I do not drink alcohol. b) ☐ I am a light drinker (two or less drinks per week).
c) I drink (per week): bottles/cans of beer glasses of wine bottles of wine shots of hard liquor

☐ ☐ ☐ 121. Have you ever been medically disqualified or terminated from employment due to a positive drug or alcohol test?

☐ ☐ ☐ 122. Have you recently been exposed to smoke or any noxious or chemical fumes?

123. Describe any hobbies or recreational activities that expose you to noise or chemicals.

	HOBBY / ACTIVITY	TYPE OF NOISE / CHEMICAL
a)		
b)		

☐ ☐ ☐ 124. Have you been exposed to loud noise today? If yes, were you wearing ear protection? ☐ Yes ☐ No

☐ ☐ ☐ 125. Have you ever been unable to hold a job or been refused employment because of any physical, mental, or other medically related reason?

☐ ☐ ☐ 126. Have you ever been rejected for or discharged from a military position because of any physical, mental, or other medically related reason?

127. I am: ☐ right-handed ☐ left-handed

SECTION 6: OTHER MEDICAL *continued*

Y N ?

☐ ☐ ☐ 128. Have you ever taken any illegal drugs? If yes, list type, frequency and date last used.

	TYPE OF ILLEGAL DRUG	FREQUENCY	DATE LAST USED
a)			
b)			

☐ ☐ ☐ 129. Have you taken any prescription or over-the-counter medications in the last 12 months? This would include vitamins, birth control pills, antacids, laxatives, aspirins, antihistamines, and weight reducing aids. If yes, list name and dosage.

	PRESCRIPTION / MEDICATION	DOSAGE		PRESCRIPTION / MEDICATION	DOSAGE
a)			c)		
b)			d)		

☐ ☐ ☐ 130. Have you ever been absent from work due to stress?

☐ ☐ ☐ 131. Have you ever had any surgical operations? If yes, list the type of surgery and when it was performed.

	TYPE OF SURGERY	DATE OF SURGERY
a)		
b)		

☐ ☐ ☐ 132. Have you been hospitalized (at least overnight)? If yes, list the year, your age, reason and length of stay.

	YEAR HOSPITALIZED	AGE	REASON	LENGTH OF STAY
a)				
b)				

☐ ☐ ☐ 133. Are you currently under a doctor's care?

☐ ☐ ☐ 134. Are you currently limited by any temporary condition (e.g., broken bone, pregnancy, recovery from surgery)? Please describe in Section 7.

☐ ☐ ☐ 135. Have you ever had any doctor-imposed activity restrictions? Please describe in Section 7.

☐ ☐ ☐ 136. Have you ever been to a doctor for back/neck pain or problems?

☐ ☐ ☐ 137. Have you ever been off work because of back/neck pain or problems?

☐ ☐ ☐ 138. Is there any history of heart disease in your immediate family?

☐ ☐ ☐ 139. Do any diseases run in your family? Please list:

☐ ☐ ☐ 140. Do you or anyone in your family have high cholesterol?

☐ ☐ ☐ 141. Do you currently have a cold/cough, or have you had either in the last two weeks?

☐ ☐ ☐ 142. Have you missed more than five (5) days from work due to medical reasons in the past 12 months?

SECTION 7: ADDITIONAL EXPLANATIONS AND SIGNATURE

Briefly explain any items marked "Yes" in Section 6. In addition, describe anything else which you feel may be important in your medical history, including any condition(s) not specifically referred to in the preceding questions.

ITEM #	EXPLANATION	ITEM #	EXPLANATION

I hereby certify that all statements made in this Medical History Statement are true and complete, and I understand that any misstatement of a material fact may subject me to disqualification or dismissal.

SIGNATURE IN FULL	DATE

State of California

MEDICAL EXAMINATION REPORT

POST 2-253 (12/01) – Page 1

Department of Justice
Commission on Peace Officer Standards and Training
1601 Alhambra Boulevard
Sacramento, CA 95816-7083

Pursuant to the Federal Privacy Act (Public Law 93-579 and the Information Practices Act (IPA) of 1977 (Civil Code Sections 1798, *et seq*.), notice is hereby given for the request of personal information. Failure to provide all or any part of the requested information may delay processing of this form, or result in an incomplete record. No disclosure of personal information will be made unless permissible under Article 6, Section 1798.24 of the IPA of 1977. Each individual for whom personal information is collected has the right to inspect that information in any record maintained by POST. Inquiries may be directed to the POST Information Practices Act Coordinator at the address listed above. Contact the POST Information Services Bureau for instructions on requesting records.

INSTRUCTIONS

- This form is to be used in conjunction with the Medical History Statement (POST 2-252) to evaluate a candidate's qualifications for the position of entry-level law enforcement officer. The form is divided into two sections.

  SECTION 1 (Completed by Licensed Examining Physician):

  Part A. Examination Results: Use this section to record all notes and test results from the medical examination. Prior to examining the candidate, (1) review the candidate's Medical History Statement, and (2) make sure that you are familiar with the relevant job demands and working conditions of the specific position for which the candidate is being considered. If unavailable, seek this information from the hiring authority.

  Part B. Candidate Assessment: This section consists of a series of questions. Your answers are intended to provide the hiring authority with the most useful information possible upon which to base the ultimate employment decision.

  SECTION 2 (Completed by Hiring Authority): This section is to be completed after you review Section 1. Your responses to the questions listed will determine whether the candidate can safely perform the essential job demands and meets the employment qualifications for the designated position.

- Type or legibly print (in ink) required information on printed form. To access this form on the POST website, go to www.post.ca.gov.

SECTION 1: TO BE COMPLETED BY LICENSED EXAMINING PHYSICIAN

CANDIDATE'S NAME (LAST, FIRST, MI)	DATE OF BIRTH (MM/DD/YYYY)

SOCIAL SECURITY NO.: - -	SEX: ☐ M ☐ F	HEIGHT (without shoes): FT INCHES	WEIGHT (without shoes and coat): LBS

Part A: Examination Results

VISION (Snellen Notation)

	UNCORRECTED		CORRECTED	
	Far	Near	Far	Near
Right				
Left				
Both				

☐ GLASSES ☐ CONTACTS

COLOR VISION:

OTHER VISION TESTS:

PERIPHERAL VISION:

Right °

Left °

CARDIOVASCULAR

BLOOD PRESSURE:

Sitting

–- Systaltic:

–- Dialysis:

Pulse

HEARING TEST

	Left	Right
500		
1000		
2000		
3000		
4000		
6000		
8000		

RETEST

	Left	Right
500		
1000		
2000		
3000		
4000		
6000		
8000		

Indicate "Normal" or "Abnormal" for each of the following conditions. Please provide detailed descriptions of abnormal findings and supplementary testing:

CHECKLIST	N	A	DESCRIPTION OF ABNORMAL FINDING AND/OR SUPPLEMENTAL TEST
SKIN			
Color / Texture (lesions, scars, etc.)	☐	☐	
HEAD / EYES			
Corneas (RK scars)	☐	☐	
Pupils / Light reaction	☐	☐	
Fundi	☐	☐	
EOM	☐	☐	
EARS / NOSE / THROAT / MOUTH			
Pinna / Canals / TM	☐	☐	
Nasal septum / Mucosa	☐	☐	
Teeth / Gums	☐	☐	
Tongue / Palate	☐	☐	
NECK / NODES			
Bruit	☐	☐	
ROM	☐	☐	
Thyroid	☐	☐	
Neck nodes	☐	☐	
Inguinal / Axillary nodes	☐	☐	
CHEST / LUNGS			
Auscultation	☐	☐	
Breasts (females age 35 and over)	☐	☐	
CARDIOVASCULAR			
Pulses: Radial, Femoral	☐	☐	
Pulses: D. Pedis, P. Tibial	☐	☐	
Apex impulse	☐	☐	
Heart sounds (murmurs)	☐	☐	
Heart rate and rhythm	☐	☐	

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CHECKLIST *continued*	N	A	**DESCRIPTION OF ABNORMAL FINDING AND/OR SUPPLEMENTAL TEST**
ABDOMEN			
Hernia	☐	☐	
Bowel sounds (Bruits)	☐	☐	
Liver / Kidney / Spleen	☐	☐	
Masses	☐	☐	
MUSCULOSKELETAL			
Upper Extremity:			
Shoulder ROM	☐	☐	
Shoulder Apprehension Test	☐	☐	
Grip strength	☐	☐	
Back:			
Heel / Toe walk	☐	☐	
Forward flexion	☐	☐	
Palpation	☐	☐	
Inspection	☐	☐	
Passive SLR	☐	☐	
Knees:			
Squat	☐	☐	
Duck-walk	☐	☐	
Inspection	☐	☐	
Thigh Circumference	☐	☐	
Lachman Test	☐	☐	
Collateral stability	☐	☐	
Patellar apprehension	☐	☐	
One leg hop for distance	☐	☐	
NERVOUS SYSTEM			
Tremor	☐	☐	
Finger-to-nose	☐	☐	
Rhomberg	☐	☐	
Reflexes	☐	☐	
Gait	☐	☐	
Vibration / Toes	☐	☐	
GENITALIA / RECTAL*			
Rectal (age 40 and over)	☐	☐	
Male: Penis	☐	☐	
Male: Scrotum / testes (hernia)	☐	☐	
Female: Pap smear	☐	☐	

***NOTE: Recent exam and test results from candidate's private M.D. are permissible.**

LABORATORY FINDINGS			
CBC	☐	☐	
Chem Panel	☐	☐	
Urinalysis	☐	☐	
ECG	☐	☐	
Spirometry	☐	☐	
Mammogram (age 35 and over)	☐	☐	
Sigmoidoscopy (age 50 and over)	☐	☐	
PPD Mantoux (if assigned to prisons)	☐	☐	
CXR (smokers age 40 and over)	☐	☐	

SUMMARY OF FINDINGS (*Continue on page 6 if more space is required.*)

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ADDRESS OF PRACTICE (Street, City, State, Zip)		PHONE: ( ) - Ext:

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Part B: Candidate Assessment

INSTRUCTIONS

- This section is to be completed by the examining physician. The following questions are designed to translate the results of the medical examination (**Part A**) into a determination of the candidate's ability to safely perform as a patrol officer.
- You should be fully familiar with the legal issues surrounding medical screening and employment of individuals with disabilities, as described in the "Pre-Employment Screening and the Law" section of the Medical Screening Manual. You should also be familiar with the agency-specific job demands and working conditions for patrol officers.
- If your responses in this section provide the employer with sufficient information to reach a decision regarding the candidate's employability, you may consider detaching **Part B** from this report and forwarding it alone to the employer for review and evaluation. This will help ensure the confidentiality of non-relevant medical information. Revealing specific medical diagnoses should be avoided unless necessary.
- Questions **1a** and **2b** solicit your suggestions regarding reasonable accommodation. In considering your responses, keep in mind that accommodations can take a variety of forms, including medication regimens, shift scheduling restrictions, environmental limitations, or use of monitoring systems or corrective devices (e.g., contact lenses).

1a. **In your opinion, does the candidate have, or is the candidate likely to develop, any physical symptoms or limitations that could impair performance as a patrol officer within the next two (2) years?**

☐ No	Proceed to question 2a.
☐ Indeterminate	Describe additional tests or information required prior to making final determination. (*Continue on page 6 if more space is required*.)
☐ Yes	Describe the impact of these limitations; include the following criteria. (*Continue on page 6 if more space is required*.) • Job functions affected:
	• Nature and degree of severity:
	• Duration of impairment (if intermittent or temporary):
	• Likelihood(s) associated with this impact:

1b. **Describe any means, devices or work restrictions that could reduce or eliminate the impact of this impairment on performance as a patrol officer. Include the manner in which the accommodation needs to be implemented, maintained, and monitored; any side effects or risks associated with the accommodation; and a revised estimate of the candidate's viability as a patrol officer if it is implemented.**

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2a. **In your opinion, could the candidate's performance as a patrol officer result in a risk to the health and safety of the candidate or others within the next two (2) years?**

☐ No	Proceed to question 3.
☐ Indeterminate	Describe additional tests or information required prior to making final determination. (*Continue on page 6 if more space is required*.)
☐ Yes	Describe this risk; include the following criteria. (*Continue on page 6 if more space is required*.) • Specific job duties and/or working conditions that precipitate the risk:
	• Nature and severity of potential harm:
	• Impact of harm on self and/or others:
	• Likelihood(s) associated with this risk:
	• Imminence and duration of the threat:

2b. **Describe any means, devices or work restrictions that could reduce or eliminate this risk to a level not significantly greater than that posed by the average candidate. Include the manner in which the accommodation needs to be implemented, maintained, and monitored; any side effects or risks associated with the accommodation; and a revised estimate of the candidate's viability as a patrol officer if it is implemented.**

3. **In summary, what is your evaluation of the candidate's ability to safely perform the duties of patrol officer?** (*Continue on page 6 if more space is required*.)

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SECTION 2: TO BE COMPLETED BY HIRING AUTHORITY

Based on the physician's assessment (Section 1, Part B), can the candidate safely perform the essential job demands of patrol officer?
(*Check all that apply*.)

☐ Yes	
☐ Yes, with accommodation	He/she needs a reasonable accommodation which can be implemented without undue hardship. (*Please specify*.)
☐ No	The individual ***cannot*** perform the essential job functions, with or without reasonable accommodation. Provide justification.
☐ No	The individual poses a ***direct threat*** to self or others, with or without reasonable accommodation. Provide justification.
☐ No	The accommodation(s) required would constitute an ***undue hardship*** for the employer. Provide justification.

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Use this space to continue your response(s) to any of the previous questions. Please identify section and checklist item or question number.

SECTION	CHECKLIST ITEM OR QUESTION #	CONTINUATION OF RESPONSE